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TONOPAH STUDY AREA GRAZING ENVIRONMENTAL STATEMENT

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BATTLE MOUNTAIN DISTRICT
NEVADA

DECEMBER 1976

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SUMMARY

Draft (x) Final ( ) Environmental Statement

Department of the Interior, Bureau of Land Management

1. Type of Action: Administrative (x) Legislative ( )

2. Brief Discription of Action: The proposal is to implement a grazing management program on national resource land (NRL) in the Tonopah area of south-central Nevada. The area of consideration encompassed by this environmental statement includes 4.5 million acres of NRL in portions of Nye, Esmeralda, and Mineral Counties, all of which are administered for grazing by the Battle Mountain District, Battle Mountain, Nevada. Components of the proposal are: 1. intensive grazing management through the implementation of 14 allotment management plans (AMPs) on 4.4 million acres, and 2. no livestock grazing on 32,490 acres. The AMPs include the implementation of specific grazing management systems and support measures (facilities and land treatments) needed to meet the multiple-use objectives of the plans which are attainable through livestock management for each specific allotment. Fencing required to implement the AMPs would also serve to eliminate grazing in those areas delineated for removal from livestock grazing.

3. Summary of Environmental Impacts: The production of desired vegetation within specific AMP areas would increase. Overall erosion susceptibility would be lessened; in eroding areas, stable or improved conditions would occur. Water quality would be protected or upgraded for specific allotments. Wildlife habitat (terrestrial and aquatic) would improve. Wildlife populations would increase or stabilize. The livestock industry dependent on NRL in the Tonopah area would be stabilized through the AMPs which specify seasons of use, livestock forage availability areas to be grazed, and sequence of grazing use. Expenditures on improvements would provide some benefits to a low per capita income area.

Fencing would impede the seasonal and daily movement of big game animals and wild horses. Free public access would be limited. Spring grazing would be harmful to vegetation when plants have not attained initial growth and vigor. Grazing animals other than livestock would continue to utilize forage in pastures designated for rest, resulting in an intensity of use on grazed years. The implementation of grazing systems will require operators to stay within livestock grazing capacities. This would require reductions in numbers of livestock, thus affecting marginal ranching operations economically.

4. Alternatives Considered:
   A. Continuation of present management (no action).
   B. Reduce levels of grazing management (custodial management).
   C. Minimal investment to achieve basic management objectives.

5. Comments will be requested from the following:
   See attachment

6. Date Draft Statement will be Made Available to CEQ and Public.
   April, 1977

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Attachment

Comments Will be Requested from the Following:

Federal Agencies

Department of Agriculture

Agricultural Research Service

Agricultural Stabilization and Conservation Service

Soil Conservation Service

U. S. Forest Service

Advisory Council on Historic Preservation

Environmental Protection Agency

Department of the Interior

Bureau of Indian Affairs

Bureau of Mines

Bureau of Outdoor Recreation

U. S. Fish and Wildlife Service

U. S. Geological Survey

Energy Research and Development Administration

Department of Commerce

Department of Defense

Department of the Air Force

State Agencies

Nevada Department of Fish and Game

Nevada State Clearinghouse (State Planning Coordinator)

Department of Conservation and Natural Resources

PRELIMINARY DRAFT

Economic Development Department

State Historic Preservation Officer (when appointed)

Nevada Highway Department

Nevada Department of Agriculture

Department of Human Resources

Nevada State Museum

Local Government

Esmeralda County Commissioners

Nye County Commissioners

PRELIMINARY
DRAFT

PRELIMINARY DRAFT

TABLE OF CONTENTS

CHAPTER I

Page

DESCRIPTION OF THE PROPOSAL

History and Background I-1

Proposed Action I-3

Interrelationship I-57

CHAPTER II

DESCRIPTION OF THE ENVIRONMENT

Existing Environment II-1

Future Environment II-270

CHAPTER III

THE ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

Assumptions and Analysis Guidelines III-1

Impact Analysis III-8

CHAPTER IV

Mitigating Measures Not Included In The

Proposed Action IV-1

CHAPTER V

Page

Any Adverse Impacts Which Cannot Be Avoided Should The Proposal Be Implemented V-1

CHAPTER VI

The Relationship Between Local Short-Term Uses of Man's Environment And The Maintenance And Enhancement Of Long-Term Productivity VI-1

CHAPTER VII

Any Irreversible And Irretrievable Commitments Of Resources Which Would Be Involved In The Proposed Action Should It Be Implemented VII-1

CHAPTER VIII

ALTERNATIVES TO THE PROPOSED ACTION

Continuation Of Present Management (No Action) VIII-3

Minimal Investment To Accomplish Basic Objectives . VIII-20

CHAPTER IX

Consultation And Coordination ..... IX-

GLOSSARY G-1

REFERENCES R-1

APPENDICES

A - Grazing Allotments and Systems A-1

B - Climate B-1

C - Air Quality C-1

D - Soils D-1

E - Water Resources E-1

F - Vegetation F-1

G - Wildlife G-1

H - Wild Horses H-1

I - Visual Resources I-1

J - Cultural Resources J-1

K - Land Use Minerals K-1

L - Social Economics L-1

PRELIMINARY
DRAFT

PRELIMINARY

DRAFT

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PRELIMINARY DRAFT

CHAPTER I

DESCRIPTION OF THE PROPOSAL

HISTORY AND BACKGROUND

In January 1975, the Bureau of Land Management (BLM) circulated a final grazing programmatic environmental statement (ES) in compliance with Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 (42 USC 4327). The statement, known as the Final Environmental Impact Statement on Livestock Grazing on National Resource Lands, discussed the proposed grazing management program, alternatives, and environmental impacts. The statement covered all national resource lands (NRL) in the United States and established a basis for subsequent environmental statements that might be required.

Several environmental interests filed a civil suit in October 1973, in the Federal District Court of the District of Columbia. They charged that the draft programmatic ES failed to comply with NEPA because it did not consider the impacts of livestock grazing upon local environments.

On December 30, 1974, Judge Thomas A. Flannery of the Federal District Court entered a judgment that the programmatic statement was insufficient to comply with NEPA.

PRELIMINARY
DRAFT

On June 18, 1975, the court approved an agreement between the BLM and the plaintiffs as a means for complete compliance with the judgment issued on December 30, 1974. The agreement calls for 212 environmental statements to be prepared nationwide for site-specific areas during the subsequent 13-year period. The statements will cover about 150 million acres of NRL used for livestock grazing. In Nevada, the agreement calls for BLM to complete 18 environmental statements, covering 48 million acres of NRL during the 13-year period.

The Tonopah study area in south-central Nevada, Battle Mountain District, was identified as the first area in Nevada for which an ES would be prepared. The selection of this area over others in the State was a logical choice because: 1. its resource base has one of the greatest potentials for improvement of any resource area in Nevada, 2. the Morey Peak area had been identified by environmental interests as one of the foremost areas in the State requiring study for primitive area designation and, 3. the Battle Mountain District Office had completed its first-generation planning effort.

The present grazing management program in Nevada was established in January 1976, by implementing the Nevada Range Policy. This policy amplifies conformance with the Federal Range Code developed pursuant to the Taylor Grazing Act. It addresses numerous livestock grazing management problems on NRL in Nevada and provides step-by-step actions necessary to remedy these deficiencies. The continued implementation of the Nevada Range Policy, as discussed

in Chapter II, Future Environment (without the proposed action), would continue in the absence of implementing a grazing management program as proposed in this environment statement. Further, the continued implementation of the Nevada Range Policy is considered as a "continuation of present management" (no action) alternative in Chapter VIII, Alternatives to the Proposed Action.

PROPOSED ACTION

The proposal is to implement a grazing management program on NRL in the Tonopah study area. The area of consideration encompassed by this environmental statement includes about 4.5 million acres in portions of Nye, Esmeralda, and Mineral counties, all of which are administered for grazing by the Battle Mountain District, Battle Mountain (see Study Area Map).

Components of the proposal area: 1. intensive grazing management through the implementation of 14 allotment management plans (AMPs) on 4.4 million acres and, 2. no livestock grazing on 32,480 acres. The AMPs include the implementation of four different grazing management systems and support measures (facilities and land treatments) needed to meet the multiple-use objectives of the plans which are attainable through livestock management for each specific allotment (see Table I, Proposed Action, and the Range Management Programs Feature Map). Fencing required to implement the AMPs would also serve to eliminate grazing in these areas identified for removal from livestock grazing.

STUDY AREA MAP

Nye and Esmeralda portions of Nevada being studied by the Tonopah Environmental Statement

PRELIMINARY
DRAFT

RANGE MANAGEMENT PROGRAM FEATURES MAP

Existing and proposed fences, spring developments, land treatments, and other range improvement facilities are shown.

PRELIMINARY DRAFT

Allotment (a unit of land designated for grazing by prescribed numbers of livestock] boundaries correspond to land divided according to historical use, individual resource values (watershed, wildlife, and vegetation), economic considerations (cost effectiveness), and topography. Each allotment represents the best combination of pastures (land units within the allotment) needed to implement the proposal grazing management system.

Table I-1, Proposed Action, identifies the grazing management program proposed for each allotment in the Tonopah study area. The table also shows the type of land by ownership and amount that would be affected by the proposal. In addition, the class of livestock, season of use, type of grazing use, and support measures (management facilities and land treatments) to implement each AMP, is indicated. Appendix A, Allotment and Systems, supplements Table I-1, by detailing the proposed grazing system for each allotment listed.

PRELIMINARY
DRAFT

PRELIMINARY

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TABLE I-1
PROPOSED ACTION

Support Measures

Allotment and Acreage	Grazing Management System: Class of Livestock	Type of Grazing System and Season of Use	Management Facilities: Fences (Miles)	Wells (Number)	Springs (Number)	Troughs (Number)	Pipelines (Miles)	Tanks (Number)	Cattle Guards (Number)	Land Treatments: Spray Seed (Acres)	Spray Only (Acres)	Chain Seed (Acres)
Blue Eagle 44,560 NRL	Cattle	5 pasture system; 2 pastures deferred rest-rotation 10/1-2/28 3 pastures deferred rest-rotation 5/1-9/30	41.4	3w	0	3	0	0	2(s) 3(d)	0	0	0
Butterfield Springs 128,280 NRL 120 Private 19,800 U.S.F.S. 148,200 Total	Cattle	4 pasture system; 2 pastures deferred rest-rotation 6/15-9/15 2 pasture: deferred #1 = 8/24-10/31 each year #2 = 11/1-12/31 each year	42.5	0	7	7	1	0	2(d)	0	0	0
Nyala 324,185 NRL 240 State 324,425 Total	Cattle	4 pasture system; 4 pasture deferred-rotation 6/15-4/15	41.0	2w 1p	0	3	8.5	2	2(d)	0	0	0
Reveille 619,645 NRL	Cattle	4 pasture deferred rest-rotation yearlong	143.0	1w 1p	0	4	5	0	7(s) 2(d)	0	0	0
Hot Creek 567,768 NRL 440 Private 80 State 568,288 Total	Cattle and Sheep	5 pasture system yearlong; 2 pastures deferred rest-rotation 6/1-10/30 3 pastures deferred-rotation 11/1-5/30	114.2	5p	4	11	16.5	0	7(s) 2(d)	10,000	0	0

TABLE I-1
PROPOSED ACTION

Allotment and Acreage	Grazing Management System: Class of Livestock	Type of Grazing System and Season of Use	Management Facilities: Fences (Miles)	Wells (Number)	Springs (Number)	Troughs (Number)	Pipelines (Miles)	Tanks (Number)	Cattle Guards (Number)	Land Treatments: Spray Seed (Acres)	Spray Only (Acres)	Chain Seed (Acres)
Wagon Johnnie 107,287 NRL 5,280 Private 19,353 U.S.F.S. 129,920 Total	Cattle	5 pasture system; 4 pastures deferred rest-rotation 5/1-9/15	20	0	4	6	11	0	1(s)	0	0	0
Stone Cabin 379,135 NRL 1,440 Private 380,575 Total	Cattle	6 pasture system yearlong; 2 pastures deferred rest-rotation 11/1-4/9 4 pastures deferred rest-rotation 4/10-10/31	86.8	2p	3	9	17.2	0	7(s) 5(d)	14,200	0	0
Ralston-Monitor 489,083 NRL 7,820 Private 78,794 U.S.F.S. 575,697 Total	Cattle	7 pasture system; Monitor: 4 pasture rest-rotation 7/1-10/15 Ralston: 3 pasture deferred rest-rotation 11/15-6/15	167.5	3p	1	13	28	0	15(s) 9(d) 2(t)	4,900	0	0
Hunts Canyon 106,357 NRL 1,510 Private 65,730 U.S.F.S 173,597 Total	Cattle	4 pasture system; 3 pasture deferred-rotation 12/1-5/30	17.2	1p	2	7	11.1	0	2(s)	3,700	960	0
Francisco 17,011 NRL 160 Indian 160 Private 17,331 Total	Cattle	4 pasture deferred rest-rotation yearlong	12.2	1p	2	5	6.1	\	4(s)	1,400	900	0

Support Measures

PRELIMINARY
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PRELIMINARY

DRAFT

TABLE I-1
PROPOSED ACTION

Support Measures

Allotment and Acreage	Grazing Management System: Class of Livestock	Grazing Management System: Type of Grazing System and Season of Use	Management Facilities: Fences (Miles)	Wells (Number)	Springs (Number)	Troughs (Number)	Pipelines (Miles)	Tanks (Number)	Cattle Guards (Number)	Land Treatments: Spray Seed (Acres)	Spray Only (Acres)	Chain Seed (Acres)
Darrough Hot Springs 14,550 NRL 400 Private 14,950 Total	Cattle	4 pasture system; 3 pasture deferred-rotation 5/1-12/31	28.5	2p	2	6	4	0	3(s)	0	1,300	0
Ione 190,059 NRL 1,040 Private 191,099 Total	Cattle and Sheep	3 pasture deferred rest-rotation 11/1-4/30	88	6p	2	13	13.3	0	3(s) 7(d) 1(t)	2,400	0	0
San Antone-Smoky 547,392 NRL (Nye) 495,606 NRL (Esmeralda) 10,110 Private 170,040 U.S.F.S 1,223,148 Total	Cattle	3 pasture deferred rest-rotation 11/1-6/30	141.6	5p	3	10	29	0	3(s) 5(d)	0	0	0
Willow Creek 12,385 NRL 36,728 U.S.F.S 49,113 Total	Cattle	2 pasture system; 3 treatment rest-rotation	4.5	0	2	6	6	0	0	0	0	2,650
Grand Total 4,043,303 NRL 26,320 Private 390,445 U.S.F.S 320 State 160 Indian 4,460,548 Acres			948.4	6w 27p	32	103	156.7	3	54(s) 37(d) 3(t)	36,600	3,160	2,650

NOTE: Abbreviations used in this table include:

NRL, national resource lands; U.S.F.S., United States Forest Service lands; w, windmill; p, power; s, single; d, double; t, triple; and pa, painted.

The proposed action would be applied to 14 allotments in the study area. A number of factors determined how the lands were divided into allotments (units of land designated for grazing by prescribed numbers of livestock). In the 1950's the area was divided into units by historical use areas and by topographic features. The BLM established grazing units in the 1960's, and these units were sometimes divided into allotments.

Purpose and Need

Generally the proposed action can be expected to maintain or improve the renewable resources of NRL, i.e., watershed, vegetation, and wildlife by applying rangeland management techniques as a tool. The Bureau needs to achieve and sustain stable soil and watershed conditions and a dependable supply of forage in balance with other resource values and uses (Taylor Grazing Act, 1934; Classification and Multiple Use Act of 1964). This is required by law.

Specifically, the purpose of the proposed action is to provide for the immediate use of Animal Unit Months (AUMs) for livestock, AUMs for wildlife use, and AUMs for wild horses. By the end of 15 years, AUMs, AUMs, and AUMs would be provided, respectively (see Tables I-2, Proposed Action, and I-4, Allotment AUMs introduced under Systems later in this Chapter.) An AUM is defined as that amount of forage necessary to sustain one cow, one horse, or five sheep for one month.

PRELIMINARY DRAFT

Components of the Proposal

PRELIMINARY DRAFT

Intensive Grazing Management

Intensive livestock grazing management would be directly applied to 14 allotments within the Tonopah study area, affecting 4,430,303 acres of national resource lands (NRL). This type of management would be implemented by the Bureau of Land Management (BLM) through its allotment management plan (AMP) program. Implementation of intensive grazing management would include an increased level of management on NRL, and entail additional operator expense for livestock management, operation, and maintenance of proposed range improvements.

An AMP is a livestock grazing plan dealing with a specific unit of range. It provides a specific management program that considers livestock grazing in relation to other uses of the range and other renewable resource values i.e., watershed, vegetation, and wildlife. Each AMP includes a specific grazing system, which consists of a schedule and sequence of grazing designed to utilize forage in such a manner as to accommodate physiological requirements of the desired vegetation and to obtain other resource management objectives (see Table I-2, Objectives). An AMP establishes the seasons of use, the number of domestic animals that would be allowed on the range, and the range improvements needed to implement the plan, such as fencing and water development.

The following steps are used in preparing an AMP:
1. Collect and analyze resource data and contact range users, 2. identify resource problems, 3. establish objectives that would resolve resource problems, 4. develop a grazing system that would accomplish the objectives, 5. establish the location and number of range improvements needed to implement the grazing system, and 6. develop evaluation procedures (studies) to determine the effects of each grazing system.

As noted in the preceding list (Item 6), evaluation procedures are built into each AMP, An AMP would be evaluated at the conclusion of each grazing cycle through various study procedures that would monitor the changes in plant composition and ground cover. Four studies are basic to the evaluation: actual grazing use, vegetative utilization, vegetative condition and trend, and climate. In addition, data on wildlife habitat utilization and trends and hydrologic response would be collected if pertinent to the allotment resource values. For example, objectives for wildlife would be established; then the achievement of these objectives would be evaluated by monitoring forage utilization and estimating hunting harvests.

If the above evaluation procedures are analyzed and it is determined that the specific objectives established for the allotments are not being achieved, modifications of the grazing systems would be made. Such modification (revisions) may include changes in the following: the grazing system, amount of use (livestock numbers), season of use, and/or any combination of these which would be deemed necessary to obtain the objectives. Any grazing system

PRELIMINARY DRAFT

could be subjected to modification prior to the end of the grazing cycle if a deterioration in the resources on an allotment were apparent. If modifications are needed, an environmental analysis of resource impacts would be completed prior to implementing a revised plan.

BLM resource managers recognize that renewable resource values stem directly or indirectly from vegetation. Therefore, following determination of management objectives for a unit of land, AMPs are developed in accordance with the physiological needs of the key vegetative species which produce and maintain identified renewable resource values on NRL. In turn, the principal tool used in AMPs for managing vegetation is livestock grazing.

An economic analysis was prepared in conjunction with the development of each AMP. Economic analysis at that stage provides assistance in: 1. determining whether proposed AMPs are economically feasible, 2. providing a basis for consideration of other alternative levels of management and investment, and 3. providing one additional method of comparing AMPs. The procedures used for evaluating project feasibility (cost effectiveness) are designed to follow standard economic principles while at the same time keeping their practical usefulness by relying on data obtained from real situations. For example, a range investment would increase available forage, reduce erosion, and have other beneficial impacts. In each year, for each type of beneficial impact, a value is estimated for the benefit obtained. Estimates of future costs can be similarly made. Finally, the relationship between estimated benefits and costs are shown as either estimates of net benefits or as the benefit-cost ratio of e.g., 1:09, 1:1,1:2, etc.

Following the ES process, the results of the economic analysis is reviewed to determine whether, for environmental reasons, the proposed action has been modified or changed to the extent that such changes will affect the AMP economic analysis. After review, the results of the economic analysis are arrayed with environmental and other information to assist the decision-maker in comparing and analyzing the proposed action and alternatives and selecting a final decision, determining priorities, scheduling implementation, and programming-budgeting.

The economic analysis is filed as part of the AMPs and may be obtained or reviewed at the Battle Mountain District office, Battle Mountain.

Grazing Systems

The 14 AMPs analyzed in this statement involve four systems of grazing--rest-rotation, deferred rest-rotation, deferred-rest, and deferred. It is assumed that through the implementation of the various grazing systems, the specific objectives for renewable resources as outlined in the AMPs would be obtained. Table I-2 shows the objectives for the 14 AMPs in the study area. Appendix A, shows in detail the proposed grazing system (grazing treatments and sequences) for each AMP designed to meet the specific objectives.

PRELIMINARY
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TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
Blue Eagle	PW No. 1 Increase: Winterfat, Indian ricegrass, Galleta grass, Low sage	PW No. 1 Maintain slight erosion class	Maintain 14 AUMs for antelope and 44 AUMs for bighorn sheep	-0-	Maintain or improve water quality at Blue Eagle Pond	Provide 1,722 AUMs yearly
	PW No. 2 Increase: Winterfat, Indian ricegrass, Galleta grass Decrease: Halogeton, Russian thistle	PW No. 2 Maintain slight erosion class				
	P No. 1 Increase: Alkali sacaton.	P No. 1 Maintain stable erosion class overall increase litter from 2% to 4%				
	P No. 2 Increase: Alkali sacaton, and Saltgrass Decrease: Rabbitbrush	P No. 2 Decrease from slight to stable erosion class				
	P No. 3 Increase: Alkali sacaton, and Saltgrass	P No. 3 Decrease from slight to stable erosion class				

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
Butterfield	PW No. 1 Increase: Indian ricegrass, Galleta grass, Forbs, Saltgrass, Decrease: Rabbitbrush PW No. 2 Increase: Bluebunch wheatgrass, Forbs, allow 50% utilization maximum on cliffrose P No. 1 Increase: Indian ricegrass, Galleta grass, Winterfat Decrease: Halogeton	Increase vegetation density by 4% and litter by 3%	Provide 838 AUMs for deer, 17 AUMs for antelope, 229 AUMs for bighorn sheep	-0-	Maintain or improve water quality at: Locke's Pond Big Well Pond	Provide 2,670 AUMs yearly
Nyala	Increase forbs to 5% of composition overall P No. 1 Increase: Indian ricegrass, Galleta grass, Winterfat Decrease: Rabbitbrush	Maintain or improve watershed conditions	Provide 64 deer AUMs, 127 antelope AUMs, and 105 bighorn AUMs	-0-	Improve or maintain existing water quality at: Goat Ranch Well, Warm Spring, Little Meadow Creek, Troy Creek	Provide 16,157 AUMs yearly

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
Butterfield	PW No. 1 Increase: Indian ricegrass, Galleta grass, Forbs, Saltgrass, Decrease: Rabbitbrush PW No. 2 Increase: Bluebunch wheatgrass, Forbs, allow 50% utilization maximum on Cliffrose P No. 1 Increase: Indian ricegrass, Galleta grass, Winterfat Decrease: Halogeton	Increase vegetation density by 4% and litter by 3%	Provide 838 AUMs for deer, 17 AUMs for antelope, 229 AUMs for big-	-0-	Maintain or improve water quality at: Locke's Pond Big Well Pond	Provide 2,670 AUMs yearly
Nyala	Increase forbs to 5% composition overall P No. 1 Increase: Indian ricegrass, Galleta grass, Winterfat Decrease: Rabbitbrush	Maintain or improve watershed conditions	Provide 64 deer AUMs, 127 antelope AUMs, and 106 bighorn AUMs	-0-	Improve or maintain existing water quality at: Goat Ranch Well, Warm Spring, Little Meadow Creek, Troy Creek	Provide 16,157 AUMs yearly

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	P No. 2 Increase: Indian ricegrass, Galleta grass, Winterfat P No. 3 Increase: Indian ricegrass, Galleta grass					
Reveille	P Nos. 1-4 Increase: Indian ricegrass, and Winterfat	Maintain or improve watershed conditions	Provide 725 deer AUMs, 434 antelope AUMs	Provide 2,400 AUMs in Pasture #1 remove horses from all other areas	Reduce sediment coliform by 50%	Provide 21,791 AUMs yearly
Hot Creek	P No. 1 Increase: Winterfat, Bitterbrush, Fourwing Saltbush, Increase plant density from 1% to 10% P Nos. 2&3 Increase: Winterfat, Indian ricegrass, and Forbs	P No. 1 Reduce erosion condition class from critical to moderate	Provide 5,360 AUMs for deer. Provide 184 AUMs in pasture numbers 4 and 5 for antelope	Provide 420 AUMs	Protect or increase water quality at Six Mile Creek, Moore's Station Limestone Spring, Keystone Spring, and Sandy Summit Spring	Increase calf crop by 15% and weaning weights by 25 pound. Provide 27,606 AUMs annually

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	P No. 4 Increase: Western wheatgrass, Squirreltail, Indian ricegrass, and Winter-fat P No. 5 Increase: Indian ricegrass, Winterfat, and Forbs					
Wagon Johnnie	P No. 1 Increase: Western wheatgrass		Maintain 20% composition of sagebrush in sage grouse nesting area and 15% in other habitat areas	Provide 420 AUMs	-0-	Provide 5,442 AUMs yearly on BLM and 318 AUMs on forest service. Increase calf crop from 56% to 70% reduce death loss from 6% to 4%
	P No. 2 Increase: Crested wheatgrass		P No. 2 Allow less than 50% utilization on important big game forage plants P Nos. 2&4 Allow 50% utilization of riparian and meadow vegetation			

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	P No. 3 Increase: Indian ricegrass P No. 4 Increase: Indian ricegrass	P No. 5 Reduce erosion condition class from critical to moderate				
Stone Cabin	P Nos. 1&2 Increase: Indian ricegrass		P Nos. 1,5&6 Reduce utilization on Bitterbrush from 60% to 45%	Provide 2,820 AUMs	Maintain or improve water quality at Haws Canyon Spring and Side Hill Spring	Provide increase in AUMs yearly to: 1st cycle 12,133 AUMs; 2nd cycle 13,689 AUMs; 3rd cycle 15,244 AUMs. If these objectives are not being met 14,200 acres of land treatment will be done in P No. 5&6
	P No. 3 Increase: Indian ricegrass, Winterfat					

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	P No. 4 Increase: Winterfat Decrease: Rabbitbrush					Increase percent calf crop from 50-80%. Increase weaning weight by 25 pounds.
	P No. 5 Increase: Indian ricegrass, Winterfat Increase vegetation density from 5% to 10%	P Nos. 5&6 Reduce erosion condition from critical to moderate				
	P No. 6 Increase: Indian ricegrass					
Ralston-Monitor	Monitor					
	P No. 1 Increase: Great Basin wildrye, Carex, Saltgrass, Indian ricegrass, Squirreltail, Increase plant density	P Nos. 1&2 Maintain slight erosion condition class	Ralston - Provide 134 deer AUMs, 323 antelope AUMs Monitor - Provide 109 deer AUMs, 36 antelope AUMs	-0-	Monitor improve or maintain water quality at: Mosquito Creek, Pine Creek, Corcoran Creek, Barley Creek Baxter Spring, Antelope Spring	In Ralston, provide 14,695 AUMs yearly In Monitor, provide 3,862 AUMs yearly Spray and seed 4,900 acres if objectives are not being met

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	P No. 2 Increase: Indian ricegrass, Winterfat, Needle and Thread, Great Basin wildrye, Squirreltail Increase plant density Decrease rabbitbrush					
	P No. 3 Increase: Great Basin wildrye, Saltgrass, Sandberg bluegrass Increase plant density from 18% to 24%	P No. 3 Reduce SSF from 80 to 64				
	P No. 4 Increase: Sandberg bluegrass, Carex Decrease: Rabbitbrush from 82% to 72%					

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	Ralston P No. 1 Increase: Winterfat, Indian ricegrass, Sand dropseed Decrease: Halogeton P No. 2 Increase: Indian ricegrass, Winterfat Decrease: Halogeton					
Hunts Canyon	Increase % composition P No. 1 Increase: Indian ricegrass		Provide 117 AUMs antelope	-0-	Improve or maintain water quality at Antelope Springs and Barley Creek	Provide 3,890 AUMs yearly Increase percentage of calf crop from 65-85%. Increase weaning weights by 75 pounds. Decrease death loss from 2% to less than 1%

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	P No. 2 Increase: Indian ricegrass, Winterfat P No. 3 Increase: Indian ricegrass, Great Basin wildrye, and Winterfat Decrease: Big sagebrush, and Rabbitbrush P No. 4 Increase: Indian ricegrass Decrease: Sagebrush, and increase crested wheatgrass through spray and seed land treatment	P No. 3 Reduce erosion class from critical to moderate				
Francisco	P No. 1 Increase: Indian ricegrass, Winterfat, Galleta grass		Provide 29 AUMs deer yearly	-0-	Maintain or improve water quality at all stock water sources	Provide 1,299 AUMs
		P No. 2 Maintain slight erosion class Increase litter from 17% to 20%				

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
		Increase vegetation density from 10% to 15%				
	P No. 3 Increase: Great Basin wildrye, and Crested wheatgrass through land treatment	P No. 3 Maintain slight erosion class				
		P No. 4 Maintain slight erosion class. Increase litter from 17% to 20%. Increase vegetation density from 20% to 25%				
Darrough Hot Springs	P No. 1 Increase: Alkali sacaton, Fourwing saltbush, Saltgrass, Great Basin wildrye, Mat muhly Decrease: Rabbitbrush, Black greasewood	P No. 1 Reduce erosion class from moderate to slight. Increase vegetation density. Increase litter from 2% to 10%	Provide 102 AUMs for deer	-0-	Maintain or improve water quality at all water sources	Provide 1,150 AUMs

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	P No. 2 Increase: Fourwing saltbush, Mormon tea, Alkali sacaton, Saltgrass, Indian ricegrass, Bud sagebrush, Shadscale, Quailbush Decrease: Rabbitbrush	P No. 2 Reduce erosion class from moderate to slight. Increase vegetation density. Increase litter from 10% to 14%				
	P No. 3 Increase: Mormon tea, Alkali sacaton, Saltgrass, Great Basin wildrye Decrease: Meadow iris	P No. 3 Reduce erosion class from moderate to slight. Increase litter from 25% to 45%. Increase vegetation density				
	P No. 4 Increase: Fourwing Saltbush, Indian ricegrass, Great Basin wildrye, Bud sagebrush, Serviceberry, Spiny hopsage, and Eriogonum spp.	P No. 4 Reduce erosion class from moderate to slight. Increase litter from 12% to 15%. Increase vegetation density				

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
Ione	P No. 1 Increase: Winterfat Decrease: Big sagebrush through land treatment	P Nos. 1-3 Change erosion class from moderate to slight	Provide 153 AUMs for deer	Provide 90 AUMs yearly	Improve or maintain water quality at all water sources	Provide 11,632 AUMs
		P No. 2 Change erosion class from critical to slight	P No. 2 Reduce utilization on Willows to 25%			
	P No. 3 Increase: Winterfat					
San Antone-Smoky	P No. 1 Increase: Eriogonum spp., Willow Decrease: Utilization of Mormon tea, Serviceberry, Scirpus spp., Willow P No. 2 Increase: Indian ricegrass, and Willow Decrease: Utilization of Willow	P Nos. 1-3 Change erosion class from moderate to slight	Provide 1,111 AUMs for deer and 10 AUMs for bighorn sheep. Increase riparian vegetation density along all water courses	Provide 90 AUMs	Improve or maintain water quality at: Willow Spring, Liberty Spring, Coyote Hole Spring, Moore's Creek, Charnock Springs	Provide 28,778 AUMs

PRELIMINARY DRAFT

TABLE I-2 a/
SPECIFIC OBJECTIVES (15 YEARS)

Allotment	Vegetation	Watershed (Erosion Class)	Wildlife	Wild Horses	Water	Livestock
	P No. 3 Increase: Eriogonum spp., and Snowberry Decrease: Utilization of Mormon tea					
Willow Creek	Increase production from 100 pounds to 500 pounds/acre Allow no more than 66% utilization on key species	Reduce stream channel erosion on willow creek. Increase ground cover to 70%	Provide 54 deer AUMs and 5 antelope AUMs yearly	Provide 263 AUMs		Provide 1,321 AM increase in 20 years

Notes: Soil Surface Factors Are:
0-20 Stable
21-40 Slight
41-60 Moderate
61-80 Critical
81-100 Severe

Abbreviations used in the table above are:
AUMs, Animal Unit Months;
SSF, Soil Surface Factor;
BLM, Bureau of Land Management;
P, Pasture
PW, Winter Pasture

a/ For pasture locations refer to Appendix A.

PRELIMINARY DRAFT

The following discusses the four (typical) grazing systems that would be directly applied to 14 allotments in the Tonopah study area.

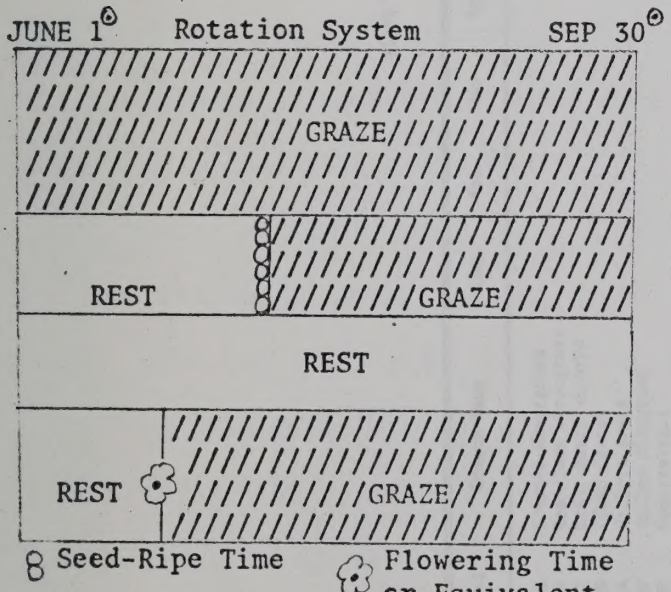
Rest-Rotation: Rest-rotation grazing systems are proposed in the Tonopah study area, encompassing acres. In order to use rest-rotation grazing on an allotment, the range would be divided into pastures, each of which would be systematically grazed and rested yearlong to provide for the production of livestock and other resource values while simultaneously maintaining or improving the vegetation and soil fertility (Hormay, Principles, Rest-Rotation, 1970, p. 16) The purpose of the rest period is fourfold. It would allow: 1. plants the opportunity to make and store food--to recover vigor, 2. seeds to ripen, 3. seedlings to become established, and 4. litter to accumulate between plants (Hormay, Principles, Rest-Rotation, 1970).

A typical rest-rotation system includes four pastures and four treatments. The first would be to graze a pasture for livestock production. The second would be to rest a pasture until the seeds ripen on the key species--the plants that need the most rest to retain vigor after being completely defoliated during the critical green period. The pasture would then be grazed, thereby letting the livestock trample the seeds which would assure that the seeds would be planted. A third treatment would involve resting a pasture for one year from livestock grazing. With the fourth treatment, a pasture would be rested until the key species have flowered; then it would be grazed. Grazing after the key-species flowering has peaked would allow seedlings that had

been established during the yearlong rest period to put out secondary roots which would, in turn, keep the livestock from pulling up and destroying new, tender plants. A pasture would be needed for each treatment that comprises rest-rotation grazing. The number of pastures, therefore, would indicate the number of treatments that would be applied to an allotment.

Table I-3, Plant Phenology, lists the dates for the development stages of the key and common grasses, forbs, and shrubs in the Tonopah study area.

The schematic diagram and grazing schedule through one cycle of a typical rest-rotation system would be as follows:



Treatments

A. Graze for livestock production.

B. Rest until seed ripe to restore vigor, then graze for seed trampling.

C. Rest season-long for seedling establishment, vigor, etc.

D. Rest until peak of flowering for seedling establishment, then graze for livestock production.

TABLE I-3
PLANT PHENOLOGY-TONOPAH STUDY AREA

	Symbol	Common Name	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Grasses	AGDE	Crested wheatgrass									XXXXXXXXXXXX			
	AGIN	Beardless wheatgrass												
	ELCI	Great Basin wildrye												
	FEID	Idaho fescue												
	HIJA	Galleta grass									XXXXXXXXXXXX			
	ORHY	Indian ricegrass												
	SIHY	Squirreltail									XXXXXXXXXXXX			
	SPAI	Alkali sacaton												
	STCO	Needle and thread												
	SPGR	Alkali cordgrass												
Forbs	AGOS	Mountain dandelion												
	CAST	Indian paintbrush												
	CRAC	Tapertip hawksbeard												
	ERIO	Buckwheat												
Shrubs	ELPA	Apacheplume												
	EULA	Winterfat												
	COST	Cliffrose												
	ARSP	Budsage												
	ATCA	4 Wing saltbush												
	CELE	Curl leaf mountain mahogany												
	ARNO	Black sagebrush												
	GRSP	Spiny hopsage												
	PUTR	Bitterbrush												
	ATCO	Shadscale												
	ARTR	Big sagebrush												

In Cartography for Table 2

PRELIMINARY DRAFT

seed production 2nd yr: growth only

Note: Symbols used in Table are:

Start Growth Green Period Full Bloom (75% or more) Seed Ripe Seed Dissemination Fall Green Up

Source: BLM Tonopah URA, 1976.

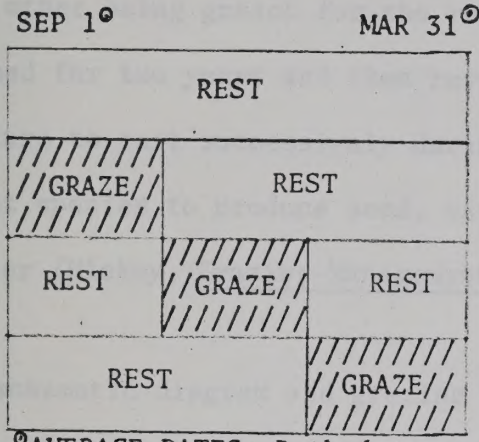
Years	Pastures 1	2	3	4
1st	A	B	C	D
2nd	B	C	D	A
3rd	C	D	A	B
4th	D	A	B	C
repeat 1st	A	B	C	D

Illustration I-1, schematic diagram and grazing schedule, typical rest-rotation system.

Deferred Rest-Rotation Grazing: Deferred rest-rotation grazing would be applied to acres in the study area. A total of deferred rest-rotation grazing systems are proposed (see Table I-1. Proposed Action).

With deferred rest-rotation two or more pastures would always be used. One pasture is rested while the others are grazed in sequence. The sequence would entail equal grazing periods for each pasture and would be determined by the carrying capacity of each pasture. Deferred rest-rotation grazing systems include the same type of yearlong rest treatment used in rest-rotation grazing systems. With deferred rest-rotation, however, the grazing treatment would be applied after the key plants have matured, which is usually in late fall or early winter, rather than during their seed-ripe stage. Applying the grazing treatment after the key plants mature would allow for increased vigor of those plants since their storage of food would have been replenished during the growing season. In addition, these plants would experience increased seed production, the seedlings would be firmly established, and the litter would be accumulated.

The schematic diagram and grazing schedule through one cycle of a typical deferred rest-rotation system would be as follows:



©AVERAGE DATES: Both dates may vary as much as one month either way.

Treatments

A. Rest yearlong for seedling, vigor, litter.

B. C. D. Graze each pasture equally (based on grazing capacity of pastures).

Pastures

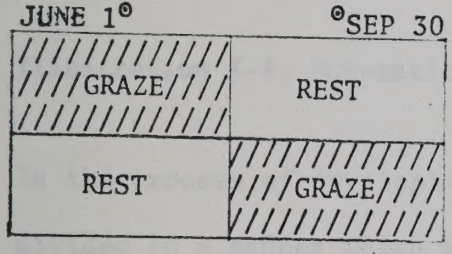
Years	1	2	3	4
1st	A	B	C	D
2nd	B	C	D	A
3rd	C	D	A	B
4th	D	A	B	C
repeat 1st	A	B	C	D

Illustration I-2, schematic diagram and grazing schedule, typical deferred rest-rotation system.

PRELIMINARY DRAFT

Deferred-Rotation Grazing: deferred-rotation grazing systems are proposed, which would affect acres in the Tonopah study area (see Table I-1, Proposed Action). Deferred-rotation grazing systems would involve two or more pastures, with one being grazed for half of the grazing period and the other being grazed for the remainder. This grazing sequence would be continued for two years and then reversed. Deferred-rotation would allow each pasture to rest successively during the growing season, thus permitting the plant species to produce seed, establish seedlings and vigor, and accumulate litter (Hickey, Grazing Management, 1966).

The schematic diagram and grazing schedule through one cycle of a typical deferred-rotation system would be as follows:



©AVERAGE DATES: Both dates may vary as much as one month either way.

Treatments

A. Graze for livestock production, then rest for plant regrowth.

B. Rest to allow plants to regain vigor and produce seed, then graze for seed trampling.

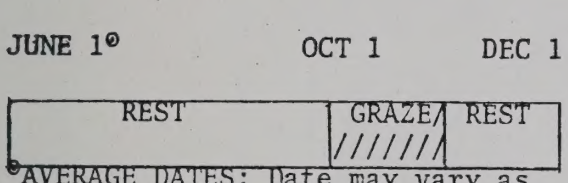
PRELIMINARY DRAFT

Years	Pastures 1	2
1st	A	B
2nd	A	B
3rd	B	A
4th	B	A
repeat 1st	A	B

Illustration I-3, Schematic diagram and grazing schedule, typical deferred-rotation system.

Deferred Grazing: As shown in Table (I-1, Proposed Action), acres in the resource area would be affected by proposed deferred grazing systems. By implementing such systems, livestock grazing would be delayed until key plants complete their annual growth cycle. Grazing would usually occur sometime after the seed-ripe stage. Reproduction, seedling establishment, improved plant vigor, and litter accumulation would occur to some extent each year (Hickey, Grazing Management, 1966).

The schematic diagram for a deferred grazing system would be as follows:



Treatment

A. Rest until end of growing season to allow all plants to complete their physiological growth requirements; then graze for livestock production and seed trampling.

Illustration I-4, Schematic diagram of typical deferred-grazing system.

In the process of developing the Tonopah grazing systems, pastures were divided in a manner which would equalize livestock carrying capacities. The AMPs are devised so as to not exceed the carrying capacity in each pasture. Thus, in a four pasture, rest-rotation system, a reduction in Animal Unit Months (AUMs) allowed in the allotment for a given year is reduced by the amount of AUMs available in the rest pasture.

PRELIMINARY
DRAFT

Table I-4, AUMs Allocated, illustrates the reduction and livestock grazing use proposed for the AMPs within the constraints of the Management Framework Plan, as well as other forage allocations in the allotment.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

TABLE I-4
ALLOTMENT AUM's

	A	B	C	D	E	F	G	H	I	J	K m/
Allotment (c) = cattle (s) = sheep	Adjudicated class I active AUM's	Livestock AUM's active use MFP decision	Livestock AMP allowable active AUM's use	Allowed wild horse AUM's-MFP decision	Allowed antelope AUM's-MFP decision	Allowed bighorn sheep AUM's-MFP decision	Allowed deer AUM's-MFP decision	Livestock % reduction adjudication to MFP	Livestock % reduction from MFP to AMP	Livestock % reduction adjudication to AMP	Livestock total AUM's in allotment
Blue Eagle (c)	2,024	1,222	978	-0-	14	44	-0-	40	20	52	1,222
Butterfield (c)	4,779	1,989	2,206 a/	-0-	17	229	838	58	+ 10	54	2,461
Nyala (c)	16,157	10,688	10,400	-0-	127	106	64	34	3	36	10,568
Reveille (c)	25,730 b/	21,791 c/	14,400 d/	2,400	434	-0-	725	15	34	44	21,791
Hot Creek (c&s)	27,606	17,253	16,825	420	184	-0-	5,360	37	2	39	19,500
Wagon Johnnie (c)	2,369	2,369	4,447 e/	420	445	-0-	2,010	0	+ 47	+ 47	5,854
Stone Cabin (c)	15,244 f/	11,145 g/	10,559 h/	2,820	365	-0-	1,099	27	5	31	11,541
Ralstons-Monitor (c)											
Ralston	14,595	13,434	11,205	-0-	323	-0-	134	8	17	23	14,875
Monitor	3,862	2,904	2,480 i/	-0-	36	-0-	109	25	15	36	2,928
Hunt's Canyon (c)	3,890	2,710	2,906 j/	-0-	117	-0-	-0-	30	+ 7	25	3,031
Francisco (c)	1,299	958	720	-0-	-0-	-0-	29	26	25	45	958
Darrough Hot Springs (c)	1,150	1,150	1,150	-0-	-0-	-0-	102	0	0	0	1,252
Ione (c&s)	10,392	10,392	6,929	90	-0-	-0-	153	0	33	33	9,352
San Antone Smokey (c)	18,176	15,922	15,322 k/	90	-0-	346	1,111	12	4	16	26,668
Willow Creek (c)											
BLM	338	338	858 l/	-0-	5	-0-	54	0	--	--	2,928
USFS	520	520									

I-23

DRAFT

Notes: Abbreviations used include: AUM's, animal unit months; MFP, Management Framework Plan; AMP, Allotment Management Plan; USFS, U.S. Forest Service; BLM, Bureau of Land Management.

a/ This figure is higher than Column B because of a boundary change for AMP.
b/ Includes 433 AUM's in Bellhelen area that is in the Stone Cabin AMP.
c/ Includes 377 AUM's in Bellhelen area that is in the Stone Cabin AMP.
d/ Does not include Bellhelen area.
e/ This figure is higher because of the two existing seedings.
f/ This does not include 433 AUM's in Bellhelen area.
g/ Does not include 377 AUM's in Bellhelen area.
h/ Includes Bellhelen area.
i/ Includes exchange of use.
j/ Includes exchange of use and U.S. Forest Service AUM's.
k/ Includes Section 15 and Forest Service use and 11145 BLM.
l/ Includes FS and BLM.
m/ This column is the amount of livestock AUM's left after reductions for wild horses and wildlife in accordance to MFP.

PRELIMINARY
DRAFT

Elimination of Livestock Grazing

By Management Framework Plan (MFP) decision, two contiguous areas within the Hot Creek allotment have been delineated for removal from livestock grazing. These areas are the proposed Morey Peak primitive area containing 14,800 acres and the proposed six mile back country area containing 17,680 acres.

Implementation Schedule

The proposed AMPs and the elimination of grazing would be implemented during an eight-year time period. Table I-5, Implementation Schedule, details when the construction of range improvements would begin on the different allotments, i.e., construction that would be required to implement the proposed AMPs and to eliminate grazing.

PRELIMINARY
DRAFT

TABLE I-5

SCHEDULE FOR DEVELOPMENTS AND LAND TREATMENTS

Year	Allotments	Fences	Wells	Springs	Troughs	Pipelines	Tanks	Cattle-guards	Spray and Seed	Spray	Chain and Seed	Remarks
1	Stone Cabin		A	A	A	A						
	Hot Creek		A	A	A	A						
2	Reveille		A		A	A		P				Fencing and cattleguards along Highway 6 and 25 excluded.
	Blue Eagle	P	A					P				
	Hunt's Canyon	A	A	A	A	A		A				
	Hot Creek	P						P				Excluding along Highway 6 but includes primitive and back country gap fences.
3	Ralston-Monitor	P						P				Only includes fencing and cattleguards along Highways 6, 25, and 8A (except north of Carvers Station).
	San Antone-Smoky	P						P				Only includes fencing and cattleguards along Highways 6, 25, and 8A (except north of Carvers Station).
	Blue Eagle	P						P				Only includes fencing and cattleguards along Highways 6, 25, and 8A (except north of Carvers Station).
	Reveille	P						P				Only includes fencing and cattleguards along Highways 6, 25, and 8A (except north of Carvers Station).
	Hot Creek	P						P				Only includes fencing and cattleguards along Highways 6, 25, and 8A (except north of Carvers Station).
	Butterfield Springs	P						P				Only includes fencing and cattleguards along Highways 6, 25, and 8A (except north of Carvers Station).
	Stone Cabin	A						A				Includes interior and highway fences.
4	San Antone-Smoky	P	A	A	A	A		P				Fencing and cattleguards along Highway 8A excluded.

PRELIMINARY DRAFT

TABLE I-5

SCHEDULE FOR DEVELOPMENTS AND LAND TREATMENTS

Year	Allotments	Fences	Wells	Springs	Troughs	Pipelines	Tanks	Cattle-guards	Spray and Seed	Spray	Chain and Seed	Remarks
5	Ralston-Monitor	P	A	A	A	A		P				Excludes fencing and cattleguards along Highway 8A and 6.
	Darrough Hot Springs		A	A	A	A						
6	Butterfield Springs	P	A	A	A	A		P				Excludes fencing and cattleguards along Highway 6.
	Nyala	A	A	A	A	A	A	A				
	Francisco	A	A	A	A	A	A	A				
7	Ione	A	A	A	A	A	A	A				
	Darrough Hot Springs	A						A				Includes Highway 8A.
	San Antone-Smoky	P						P				Only the remaining portion north of Carver's not fenced during year three.
8	Stone Cabin								A			Land treatment will be implemented only if the range resource does not respond enough to grazing system mgmt.
	Hot Creek								A			Land treatment will be implemented only if the range resource does not respond enough to grazing system mgmt.
	Hunt's Canyon											Land treatment will be implemented only if the range resource does not respond enough to grazing system mgmt.
	Ione								A	A		Land treatment will be implemented only if the range resource does not respond enough to grazing system mgmt.
	Ralston - Monitor								A	A		Land treatment will be implemented only if the range resource does not respond enough to grazing system mgmt.

PRELIMINARY DRAFT

TABLE I-5.

SCHEDULE FOR DEVELOPMENTS AND LAND TREATMENTS

Year	Allotments	Fences	Wells	Springs	Troughs	Pipelines	Tanks	Cattle-guards	Spray and Seed	Spray	Chain and Seed	Remarks
	Francisco								A			Land treatment will be implemented only if the range resource does not respond enough to grazing system mgmt.
	Darrough Hot Springs									A		Land treatment will be implemented only if the range resource does not respond enough to grazing system mgmt.

NOTE: Abbreviations used in table are:

A = All
P = Partial

PRELIMINARY
DRAFT

Development of Range Improvements

As previously noted, the development of range improvements would be required in order to facilitate the implementation of the intensive management and the elimination of grazing. Construction of fences, cattleguards, pipelines, spring developments, water troughs, and water storage tanks would be required for implementing the proposed AMPs.

Cultural Resource Clearance: Areas of proposed range improvements would be surveyed prior to construction to determine the presence or absence of cultural resources. If cultural resources were found, the project would be changed to avoid damaging the cultural site. If the project could not be changed, the site would be evaluated to determine whether it would be salvaged or if the project should be abandoned. If necessary, the project would be abandoned. If cultural material was discovered during construction or treatment, work would be modified or stopped pending further instruction of the BLM District Manager.

Environmental Protection: As discussed in Chapter III of this environmental statement, some environmental impacts are known, anticipated, or hypothesized, thereby providing a basis for specifying adequate protective measure through mitigation (Chapter IV). Proposed grazing management facilities and land treatments are, however, in most instances conceptual As such it is conceivable that not all contingencies have been provided for through the proposed action or as a result of mitigation.

PRELIMINARY
DRAFT

Additional mitigating measures may be required on a case by case basis for the protection of unknown, but important, site-specific values. This would necessitate an on-site field inspection for each construction or land treatment proposal prior to its placement on the ground to insure the protection of impacted resource values.

Maintenance: Various procedures would be followed to maintain range improvements. Each year water developments would be inspected to insure that they were in usable condition, and preventative maintenance would be performed as needed. Fence maintenance would be carried out in accordance with established district schedules. Any repairs requiring actual reconstruction of an improvement would be done by the BLM. Operational or preventative maintenance required annually or more frequently, however, would be performed by the individual allottee.

Design Features: The BLM Battle Mountain District has identified the following design features that would be followed if range improvements were to be constructed in the Tonopah study area: 1. No permanent trails or roads would be constructed to most sites; where additional permanent access would be required, roads would be constructed to include drainage and to conform to standards, 2. Archaeological clearance would be required for all project sites prior to new construction, 3. All disturbed areas would be reseeded if practical and feasible with a mixture of native and/or introduced species in order to replace ground cover on the sites, 4. Disturbance at all sites would be

PRELIMINARY
DRAFT

held to a minimum, 5. No clearing of the project sites would be allowed except on sites requiring excavation, and 6. Water developments would be designed to provide water May through October at all established watering troughs and yearlong in pastures containing wild horses.

Additional design features which have been specifically established for individual range improvements are identified in the subsequent discussion of the individual improvements.

Fences -- An estimated 948 miles of fence would be required in the study area to keep livestock within desired areas (see Illustration I-5, Typical Fences).

PRELIMINARY
DRAFT

Illustration I-5. Typical Fences. Specifications of standard barbed wire fence, cattle fence on antelope range, sheep fence on antelope range, cattle and sheep fence on antelope range, and bighorn sheep fence.

PRELIMINARY
DRAFT

Fence construction would involve the following steps: 1. The fence lines would be surveyed. This survey would be tied to known reference points (section corners, when available), 2. Stretch panels (two to three wooden posts approximately six feet apart with wooden braces between each post) would be constructed at each quarter-mile point along the lines. (Barbed wire comes in quarter-mile lengths), 3. The top wire would be unrolled and stretched between panels, 4. Steel posts would be driven approximately 16.5 feet apart; wood line posts may be substituted or used in lieu of steel posts where needed, 5. The remaining wires would be unrolled and stretched between the panels, 6. The wires would be attached to each post at a specified spacing (see design features), and 7. Steelwire stays would be placed between each post.

Each of these operations would normally require off-road vehicular traffic along the fence (15 to 20 trips) which, along with the fence construction, would disturb an estimated 1,708 total acres.

Unpainted (galvanized) steel posts would be used in constructing fences so that the posts would blend into the landscape. If there were a need to increase fence-post visibility, however, red or green steel posts or wooden posts would be used.

Where fences cross existing roads, either gates or cattleguards would be installed. Existing netwire fences would be modified to meet the standard fence specifications.

PRELIMINARY
DRAFT

PRELIMINARY
DRAFT

Other fencing characteristics include: 1. All new fences would have at least one gate every mile and gates in every right-angle corner, 2. All wire gates would have an opening device, 3. The only right-of-way clearing allowed would be the hand limbing and removal of an occasional tree that might be in direct alignment with a fence, Fence would be attached to living trees by placing a four-foot section of a 2-by-6 inch board between the tree and the wire, 4. Division fences (pasture and boundary) would be built with barbed wire for the top two strands and smooth wire for the bottom strand to allow movement of big game, 5. For range not used by bighorn sheep, the following spacing would be used for fence wires (antelope-type fencing): bottom wire, 16 inches above the ground; middle wire, 26 inches above ground; and top wire, 38 inches above ground, and 6. For range used by bighorn sheep, the following dimensions for wire spacing would be followed: bottom wire, 20 inches above ground; middle wire, 35 inches above ground; and top wire, 39 inches above ground.

Cattleguards -- Cattleguard construction would involve the excavation of a hole approximately 8 feet wide, 12 feet long, and 24 inches deep (See photo illustration I-6, Typical Cattleguard).

Illustration I-6. Typical Cattleguard. Photograph of a single, precast concrete cattleguard.

PRELIMINARY
DRAFT

A precast concrete base would be set into the excavation, and earth would be backfilled and compacted around the base so that the excavation would remain in the middle of the base. A metal grid with openings large enough to keep animals from walking across the guard, but close enough to allow vehicles to drive over it, would be set onto the base so that the grid would not move.

Where cattleguards were placed across roads, a gate would be placed to one side to allow movement of livestock through the fence when needed. In addition, extremely heavy loads or wide loads could be taken through the gate rather than over the cattleguards which would be built with a 15-to-20-ton load limit. Ninety-four cattleguards are proposed to be constructed, disturbing an estimated 9.4 total acres.

Pipelines -- An estimated ~~157~~ miles of pipeline would be needed to carry water from a source (well, stream, spring,) to an area where drinking water would be available to livestock (See photo illustration I-7 for a pipeline example). Generally, one-and-a-quarter inch diameter plastic pipe would be used and would be buried with a pipe-laying device mounted on a tractor.

PRELIMINARY DRAFT

Illustration I-7. Typical Pipeline. Photograph shows tractor with pipeline laying "ripper tooth."

The pipe-laying device would be a "ripper tooth," less than 4 inches wide with a forward curve which would help hold the end of the tooth at the desired depth. A pipe of three to four inches in diameter would be welded to the backside of the ripper tooth and would curve outward to the tractor. A pipe roll holder mounted on the tractor and the pipe would be threaded through the backward bent pipe on the ripper tooth. The end of the plastic pipe would be anchored. The tractor would lower the ripper tooth, move forward with the plastic pipe, and feed it into the pipe that would lay the plastic pipe. As the tractor would move forward, the earth would settle back around the pipe being laid so that a slight rise of four inches or less with a visible crack of varying widths (generally less than two inches) would be the only remaining disturbance except for tractor tracks.

The pipe would normally be laid from nine to thirty inches under the ground surface, depending upon where rock was found. Where surface rock would prohibit the burying of pipeline, it would be laid on the surface. In some instances, a backhoe or trencher would be used to prepare a pipeline trench.

For pipeline installations, no right-of-way clearing or road construction would be permitted except for the removal of an occasional tree that could not be bypassed. An estimated 188 total acres of surface disturbance would occur during construction.

Wells -- Thirty-three wells would be constructed by drilling a hole with a diameter ranging from four to eight inches at a depth ranging from 100 to 800 feet. Each well would be cased to prevent cave-ins. Various types of pumps would be used to bring water to the surface--windmills, and pump jack piston types. Surface disturbance of an estimated 16 total acres would be

associated. with construction.

Water Storage Tanks -- Three storage facilities would be placed at predetermined areas, and a pipeline would be attached to them (see photo Illustration I-8). These facilities would be made out of metal and their size would be determined by the number of animals requiring water from the source. Generally, the tanks would be enclosed and would measure 15 to 30 feet in diameter; they would be 6 to 12 feet high. Water would drain from the bottom of the storage facility. The outside of the tank would be painted a color that would blend with the surrounding landscape so as to lessen the visual impact. An estimated 16 total acres of surface disturbance would occur with the proposed three storage tanks.

PRELIMINARY
DRAFT

Illustration I-8. Typical Water Storage Tank. Photograph shows a 30,000 gallon vertical tank.

Springs--Thirty-two springs are proposed to be developed. For a spring that would produce as a point discharge, the normal development procedure would be to excavate a hole with a backhoe. The hole would usually be five feet x five feet x five feet. A vertical perforated pipe would be inserted and would function as a collection box. Water would be piped in a small-diameter (generally one-and-a-quarter inches) plastic pipe from the box to the trough. For sites where the water seeps from a larger area instead of a point source, the gathering devices would be perforated pipes horizontally trenched in the seep. Water would be moved by pipe from the gathering device to a vertical head box from which it would be piped into the trough. (see Illustration I-9 for spring development.)

If the spring did not produce sufficient water to furnish a continuous supply of water for the number of animals drinking, a storage tank would be placed between the gathering box and the drinking facility. The size of the storage tank would be determined by the capacity of the spring, gallons required per day, and the number of days' supply needed for the safety of the animals. A cow requires 10 gallons of water per day; a sheep, 3 gallons per day; and a horse, 12 gallons per day.

Spring improvements would also include fencing to prevent trampling and overgrazing of the wet meadow areas. An estimated 6.4 total acres would be disturbed by spring developments.

The following design features would be applied to spring developments of the Tonopah study area:

PRELIMINARY
DRAFT

Illustration I-9. Typical Spring Development. Layout of perforated pipe and spring box head is shown.

PRELIMINARY
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PRELIMINARY DRAFT

1. Actual development work on and around the spring would be done with hand tools when possible, 2. If machinery were needed, an 18 inch X 24 inch back-hoe, mounted on a tractor, would be used. At no time would a dozer, front-end loader, or scraper be involved. 3. When work was completed, the work area would be cleared of all trash and damaged or excess material, which would be taken to a refuse disposal site, 4. All cuts, fill, and excavations would be dressed and blended with the surrounding area, 5. All disturbed areas with mineral soil showing would be seeded and/or planted with native grass and/or brush to blend with the undisturbed area, and 6. Wet areas around springs would be retained, when possible, by permitting some water flow at the site. This would be accomplished by installing an overflow on the headbox, which would drain into a sump constructed near the spring source.

Water Troughs -- One hundred and three drinking facilities (troughs) are proposed. They would be round tanks or rectangular metal boxes of varying lengths. The size of each trough would be determined by the number of animals expected to drink from it at one time. Generally, wooden posts, partially buried in the ground in a wooden frame around the trough would be used to steady the trough and to keep livestock out. (See Illustration I-10 Surface disturbance would affect an estimated 21 total acres.)

Illustration I-10. Typical Water Trough. Photograph shows rectangular metal trough.

The following design features would be met on all troughs that would be constructed in the resource area: 1. Ramps would be provided in each water trough to allow animals and birds to escape, and 2. The lip of the water trough would be no higher than two feet above the ground, when possible, to allow antelope and deer fawns to water.

Land Treatments

Chaining

Two thousand six hundred and fifty acres of sagebrush vegetation type within the proposed Willow Creek allotment would be chained in the fall if the proposal were followed. Two track-type tractors approximately 100 to 200 feet apart, would "chain" by dragging a 200 to 600-foot anchor chain between them. See photo Illustration I-11.

PRELIMINARY
DRAFT

Illustration I-11. Typical Chaining Equipment. Photograph shows two tractors pulling an Ely chain.

PRELIMINARY
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Aerial spraying

The proposal calls for the aerial spraying of a total of 3,160 acres of sagebrush-grass vegetation type. Of this, 960 acres in Hunts Canyon allotment, 900 acres in Francisco allotment, and 1,300 acres in Darrough Hot Spring allotment would be sprayed with 2,4-D in an oil or water emulsion during May or June.

The chemical emulsion would be applied by fixed wing aircraft or helicopter. The chemical would not be applied within one-half mile of perennial (yearlong) water. Spraying would be in an uneven pattern to give a wildlife edge effect (a method to increase the linear habitat wildlife could occupy), and to help mitigate straight line contrast.

Aerial spray and seed

After spring aerial spraying called for in the proposal, the following fall the area would be seeded using a rangeland drill. A total of 36,600 acres would be treated: 10,000 acres would be treated in the Hot Creek allotment; 14,200 acres in the Stone Cabin allotment; 4,900 acres in Ralston-Monitor allotment; 3,700 acres in Hunt's Canyon allotment; 1,400 acres in Francisco allotment, and 2,400 acres in Ione allotment.

Cost of Support Measures

Table I-6 summarize the materials and construction cost of the proposed improvements.

TABLE I-6
MATERIALS AND CONSTRUCTION COSTS BY ITEM AND ALLOTMENT

Livestock Allotments

	Item / Allotment	Fence Miles	Fence Dollars	Cattleguards[a] Number	Cattleguards[a] Dollars	Pipeline Miles	Pipeline Dollars	Springs Number	Springs Dollars	Troughs[b] Number	Troughs[b] Dollars	Wells Number	Wells Dollars	Spraying Acres	Spraying Dollars	Seeding Acres	Seeding Dollars	Chaining Acres	Chaining Dollars	Total Dollars	B/C Ratio
1	Blue Eagle	41.4	88,700	8	14,100					3	1,050	3	36,500							140,350	.587:1
2	Butterfield	42.5	124,400	4	7,050	1	3,600	7	16,100	7	2,400									153,550	.85:1
3	Nyala	41.	88,000	4	7,050	8.5	30,800			3	3,500	3	52,100							181,450	3.31:1
4	Reveille	143.	268,600	11	19,400	5.	17,800			4	1,400	2	47,500							354,700	20.85:1
5	Hot Creek	114.2	236,100	11	19,400	16.5	60,000	4	9,200	11	3,800	5	116,900	10,000	135,000	10,000	80,000			660,400	1.77:1
6	Wagon Jonnie	20.	47,500	1	1,800	11.	39,500	4	6,800	6	1,850									97,450	1.27:1
7	Stone Cabin	86.8	161,900	17	30,000	17.2	62,500	3	7,100	9	3,100	2	35,900	14,200	99,400	14,200	113,600			513,500	1.16:1
8	Ralston - Monitor	167.5	310,700	39	68,900	28.	87,500	1	1,650	13	4,500	3	67,800	5,025	69,000	5,025	38,600			648,650	1.26:1
9	Hunts Canyon	17.2	40,200	2	3,550	11.1	41,900	2	4,450	7	2,400	1	17,100	4,660	60,600	3,700	29,600			199,800	1.22:1
10	Francisco	12.2	26,900	4	7,050	6.1	21,400	2	4,600	5	2,050	1	3,400	2,300	32,800	1,400	11,900			110,100	.73:1
11	Barrough Hot Springs	28.5	57,200	3	5,300	4.	14,600	2	4,600	6	1,850	2	30,100	1,440	15,800					129,450	.41:1
12	Ione	88.	187,300	20	35,300	13.3	54,500	2	4,600	13	4,800	6	94,000	2,400	24,000	2,400	16,800			421,300	1.70:1
13	San Antone - Smoky	141.6	269,000	13	22,900	29.	104,800	3	4,950	10	3,450	5	101,900							507,000	2.22:1
14	Willow Creek	4.5	10,700			6.	21,500	2	3,400	6	1,850							2,650	21,200	58,650	No A/e
	Total	948.4	1,917,200	137	241,800	156.7	560,400	32	67,450	103	38,000	33	603,200	40,025	436,600	36,725	290,500	2,650	21,200	4,176,350	

a/ Represents cost of all single cattleguards which comprise the 94 cattleguards planned (Table I-1).
b/ Includes the cost of three water storage tanks (Table I-1).

PRELIMINARY
DRAFT

INTERRELATIONSHIPS

BLM Multiple Use Planning System

The proposed action is based on land use allocation decisions developed through the Bureau of Land Management's multiple-use planning system. Program activity plans such as the AMPs described in the preceding sections constitute the action component following a detailed resource inventory and planning process. (A description of the planning system can be found starting on page I-21 of the Final Environmental Impact Statement on Livestock Grazing on National Resource Lands published by the U.S. Department of the Interior, December 31, 1974. Specific details are contained in BLM Manuals 1601-1608.)

Briefly, the stages include the Unit Resource Analysis (URA) or resource inventory, the Planning Area Analysis (PAA) or social-economic considerations, and the Management Framework Plan (MFP) or the actual land use decisions. The analysis process is an interdisciplinary team effort, considering trade-offs among recommendations that often reflect conflicts among potential uses of the different resources. The various activity plans are then drawn up based on the final land use decisions contained in the MFP.

BLM Plans and Programs

The MFP for the Esmeralda Resource Area was not complete in the fall of 1976. This means there were no formalized management constraints placed on preparation of AMPs covering that portion of Esmeralda County included in the Tonopah grazing environmental statement.

PRELIMINARY DRAFT

The Tonopah Resource Area MFP was completed in September 1976. Among the land use allocation decisions made during the MFP process was a forage allocation decision. Forage requirements were identified and allocations were made for fivestock, wild horses, and wildlife. These allocations were made on the basis of range surveys which demonstrated the available forage in the resource area. Because the present demand from the three groups of animals using this forage exceeds the available supply, a management decision on forage allocation was required. This decision was based on the availability of forage, deductions made for excessive slope (50 percent or more), distance from water (four miles or more), and public input. The results are summarized below and detailed in Table I-4, Allotment AUMs.

LIVESTOCK

AUMs Demand - 148,414
AUMs Allocated - 115,193

WILD HORSES

Present Numbers - 1,538
AUMs Demand - 18,227
Recommended Numbers - 520
AUMs Allocated - 6,240

WILDLIFE

Deer AUMs Demand - 15,788.
Deer AUMs Allocated - 12,257
Antelope AUMs Demand - 2,116
Antelope AUMs Allocated - 2,070
Bighorn Sheep AUMs Demand - 546
Bighorn Sheep AUMs Allocated - 546

During preparation of the AMPs, some allotment boundaries were redrawn, and some national forest lands were included in the allotments. The result is that the forage allocation figures presented in the AMPs differ from those shown in the MFP (see Table I-4, Allotment AUMs).

The proposed grazing program would be coordinated with other BLM activities in the study area. (Coordination with programs of other agencies is the subject of the next section.) Details of the land use allocation decisions for each resource activity are contained in the Tonopah and Esmeralda Resource Area MFPs. Copies of the former are on file in the Tonopah Resource

PRELIMINARY DRAFT

Area Headquarters in Tonopah, in the Battle Mountain District Office in Battle Mountain, and in the Nevada State Office in Reno. The latter may be found in the Las Vegas District Office and the Nevada State Office.

Other decisions made in the MFP will have an effect on or will interact with livestock grazing. Most of the resource activities call for improved management practices for livestock through implementation of AMPs. These practices are expected to benefit such other resources as wildlife, watershed, and recreation.

One of the activities with which grazing would be closely coordinated is the wildlife habitat program. Eleven Habitat Management Plans (HMPs) are proposed to be implemented concurrently with the AMPs as funding permits. Among the goals of the HMPs (as stated in the MFP) are: improvement of deteriorated aquatic, riparian, and meadow habitats in the area; and maintenance, protection, and restoration of crucial wildlife areas.

The wild horse program calls for development of eight wild horse management plans. Specific herd management areas with optimum horse numbers and forage allocation are spelled out in the MFP. (There are no wild burros in the study area). Close coordination with the grazing program is necessary.

Other BLM programs to coordinate with grazing (and each other) include watershed management, lands (utility rights-of-way, agriculture), minerals (mining, geothermal and oil leases), woodland management (firewood, fence posts, Christmas trees), recreation (archaeological and cultural resources, hunting and fishing, sightseeing, proposed primitive area), and support services (cadastral survey, fire management, access).

Some specific examples of MFP decisions affecting the livestock program follow. An intensive survey of threatened and endangered plants will be undertaken in the study area. In addition, recreation decisions were made to close to livestock use 14,800 acres in the Morey Peak proposed primitive area and 17,680 acres in the Six-Mile Back Country use area. Where visual aesthetics along streams are not improved through implementation of AMPs, livestock grazing would be deferred until after the peak recreation season.

BLM has issued leases on the Blue Eagle Springs oil field covering approximately one square mile in northeastern Railroad Valley. A new oil discovery was made in the fall of 1976 a few miles west of the Eagle Springs field and numerous lease applications have been filed on the majority of the valley. There has been no conflict in the past between the oil developments and livestock grazing, and none is anticipated in the future.

Where a proposed grazing system crosses district boundaries, an interdistrict grazing agreement is made. Such an agreement exists between the Battle Mountain and Ely Districts. Another was to be prepared in 1976 between Battle Mountain and the Las Vegas Districts.

Other Agency Programs

Other federal agencies, as well as the State of Nevada, have programs in the study area with which BLM activities are coordinated. BLM's grazing program relates to several of these agencies.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

U.S. Forest Service (USFS)

Because of the close association of national resource lands (NRL) and national forest lands, several livestock permittees operate under both BLM and USFS jurisdiction. In addition, wildlife and wild horses utilize both NRL and national forest land as their normal range. This necessitates close cooperation between the two agencies. Where appropriate, the AMPs described as the proposed action is being coordinated with the Toiyabe and Humboldt National Forests.

Cooperative agreements currently exist with the USFS for the Wagon Johnnie and Willow Creek AMPs. Other interagency agreements are being formulated between BLM and the Forest Service on the Smoky, San Antone, Hunt's Canyon, Ralston, Stone Cabin, Butterfield, Nyala, and Ralston-Monitor allotments to allow BLM to license use on national forest lands and to resolve some discrepancies between the AMPs and USFS land use plans.

U.S. Fish and WIldlife Service (USF&WS)

The USF&WS is authorized to carry out animal control programs in cooperation with other federal and state agencies. Predatory animals and rodents may be controlled on federal lands when damages to other resources can be demonstrated. Incidents of animal damage and predation are reported to the USF&WS which compiles records of damages and requests authorization to control the problem animals on national resource lands.

The USF&WS also reviews environmental statements prepared by other federal agencies, to ensure wildlife, wildlife habitat, and threatened

The USF&WS is charged with the responsibility of identifying critical habitat for endangered species, but no such area is known to be in the Tonopah study area. A list of threatened and endangered plant species has not yet been published in final form, but BLM and the USF&WS would coordinate on appropriate protection measures when final identification is complete.

Nevada Department of Fish and Game (NDF&G)

BLM works closely with the NDF&G during development of the Bureau's land use plans. The new wildlife habitat management plans recommended in the MFP would be prepared in consultation with the NDF&G. Two co-operative Habitat Management Plans (HMPs) are currently in existence, the HMP for Morey Bench Winter Deer Range (1967) and the HMP for the Railroad Valley Wildlife Management Area (1974).

For all land treatments proposed, close coordination with NDF&G would be required regarding layout and design.

Energy Research and Development Administration (ERDA)

An arrangement has been made between the Bureau and ERDA whereby BLM can take over hydrologic data test holes drilled by ERDA to use them as sources of water for livestock and wildlife.

PRELIMINARY
DRAFT

Nevada Department of Highways

By MFP decision BLM land bordering a State highway would be fenced and cattle-guards would be constructed. Presently no agreement exists between the Nevada State Highway Department and BLM. However, it is assumed that for any agreement made, both agencies would share equally the cost of fence construction and cattleguards.

Soil Conservation Service (SCS)

The SCS provides technical assistance and financial assistance through the Agricultural Stabilization and Conservation Service (ASCS) to landowners in the area who want to improve their private rangelands. The ASCS provides cost sharing on fences, water developments, erosion control, and practices to remove woody plant species, while the SCS provides the technical support in planning, surveying, designing, and laying out the project. In the Tonopah study area, their activity and programs are confined to non-federal lands. The AMP systems are not dependent on non-Federal lands, so were not closely coordinated with the SCS ranch plans.

PRELIMINARY
DRAFT

PRELIMINARY
DRAFT

TONOPAH CH. II

PRELIMINARY
DRAFT

PRELIMINARY
DRAFT
TUNGPAH Ch. 11
PRELIMINARY
DRAFT

CHAPTER II

DESCRIPTION OF THE ENVIRONMENT

EXISTING ENVIRONMENT

The following section describes the environment, or baseline conditions, in the Tonopah study area as they exist today - without the proposed action. Emphasis is placed on those aspects of the environment most likely to be impacted by the proposal, with the level of detail being commensurate with the degree of impact. Parts of the environment which are not impacted in a major way or do not play a principal role in the impact analysis process are not described.

PRELIMINARY
DRAFT

CHAPTER II

DESCRIPTION OF EXISTING ENVIRONMENT

The following section describes the environment, or baseline conditions in the Tongass study area as they exist today - without the proposed action. Emphasis is placed on those aspects of the environment most likely to be impacted by the proposal, with the level of detail being commensurate with the degree of impact. Parts of the environment which are not impacted in a major way or do not play a principal role in the impact analysis process are not described.

PRELIMINARY
DRAFT

Climate

The Tonopah study area's climate is characteristic of the high, cold desert, or dry steppe, with highly variable precipitation patterns, extreme variations in diurnal (daily) temperatures, and well-developed seasons. Major climatic determinants are the region's continentality, or separation from moist Pacific weather by the Sierra Nevada Range; its latitude (between 38 and 39 degrees north latitude); and elevations.

Illustration B-1, Weather Station Locations, and Table B-1, Weather Station Descriptions, in Appendix B show where most data is collected in the study area.

Elevation differences between valleys and mountain ranges give the study area six basic climatic-vegetation zones: 1. mid-latitude desert, 2. dry steppe, 3. moist steppe, 4. dry subhumid continental, 5. moist subhumid continental, and 6. alpine. Illustration II-1, Climate and Vegetation, shows the effects of elevation on climate and vegetation zones in the Tonopah study area.

PRELIMINARY
DRAFT

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The Tonopah study area's climate is characteristic of the high, cold desert, or dry steppe, with highly variable precipitation patterns, extreme variations in diurnal (daily) temperatures, and well-developed seasons. Major climatic determinants are the region's continentality, or separation from moist Pacific weather by the Sierra Nevada Range; its latitude (between 37 and 39 degrees north latitude); and elevations. Illustration II-1, Weather Station Descriptions, in Appendix A shows where most data is collected in the study area.

Elevation difference between valley and mountain ranges give the study area its basic climatic-vegetation zones: 1. mid-latitude desert, 2. dry steppe, 3. moist steppe, 4. dry woodland continental, 5. moist woodland continental, and 6. alpine. Illustration II-1, Climate and Vegetation, shows the effects of elevation on climate and vegetation zones in the Tonopah study area.

PRELIMINARY
DRAFT

Illustration II-1. Elevation Effects on Climate and Vegetation Zones in Tonopah Study Area.

PRELIMINARY
DRAFT

PRELIMINARY
DRAFT

Precipitation

The study area lies generally in a transition zone between Pacific and Gulf weather influences and receives precipitation from three sources:

Winter: frontal systems arising from storms moving inland off the Pacific Ocean during November, December, January, and February.

Summer: convective thunderstorms from the Gulf of Mexico during July, August, and September.

Spring: storms originating over the continental land mass during March, April, and May, and to a lesser extent, in October and November.

Over 50 percent of the mean annual rainfall is associated with the "Tonopah Lows", or locally developed systems which pick up moisture from storms out of the Northwest during spring and fall. Table II-1, Annual Precipitation by Season, and Illustration II-2 show the relative amounts of winter, spring, summer, and fall precipitation.

PRELIMINARY
DRAFT

TABLE II -1
ANNUAL TOTAL PRECIPITATION AND AMOUNTS, BY SEASON*

Allotment	Mean Annual Precipitation (inches)	Precipitation in Inches Spring Apr.1-Jun.30	Summer Jul.1-Sep.15	Fall Sep.16-Nov.30	Winter Dec.1-Mar.31	By Season N/S Influence	Percent of Yearly Rainfall by Seasons, Northern and Southern Climate Influence	
Blue Eagle	6.0	1.3	1.6	1.1	2.0	S		South
Butterfield	6.0	1.3	1.6	1.1	2.0	S	Winter	32.7
Nyala	6.0	1.3	1.6	1.1	2.0	S	Spring	22.2
Reveille	5.0	1.2	1.3	.9	1.6	S	Summer	26.8
Hot Creek	10.0	1.8	2.4	1.8	4.0	N	Fall	18.3
Wagon Johnnie	12.0	2.2	2.9	2.1	4.8	N		
Stone Cabin	8.0	1.8	2.1	1.5	2.6	S		North
Ralston-Monitor	10.0	2.2	2.3	1.7	3.8	S/N	Winter	40.4
Hunts Canyon	14.0	2.5	3.4	2.5	5.7	N	Spring	17.4
Francisco	13.0	2.1	3.0	2.1	5.3	N	Summer	23.9
Darrough Hot Springs	7.0	1.3	1.7	1.3	2.8	N	Fall	17.8
Ione	8.0	1.4	1.9	1.4	3.2	N		
Willow Creek	13.0	2.1	3.0	2.1	5.3	N		
San Antone - Smoky	9.0	1.8	2.3	1.6	3.3	S/N		
Wettest Month:		April	August	November	January			

* Note: Seasons Correspond to Grazing Seasons

SOURCE: Bureau of Land Management, Nevada State Office, unpublished data for 9173 Manual, Studies and Hydrology, 1976.

PRELIMINARY
DRAFT

Illustration II-2. Percent of Mean Annual Precipitation by Month and Season.

The winter and spring precipitation are the more beneficial of the three moisture sources. The winter storms, which bring 10 to 40 inches of snow over about half the area, replenish soil moisture through snowmelt. Spring storm precipitation maintains the soil moisture somewhat during the spring growing season and provides small amounts of additional moisture for evapo-transpiration, or water consumed by vegetation plus that evaporated from the soil. Ten inches of snow is equivalent to one inch of rain. Valley bottoms receive less than 10 inches mean annual snowfall, while elevations above 8,000 feet receive from 40 to 80 inches of snowfall.

Summer precipitation is in the form of erratic, short-duration thunderstorms. The precipitation is not greatly influenced by elevation differences, and is of little agricultural value because of: 1. Great loss of evaporation, 2. Small geographical extent of the storms, 3. The high degree of variability in their occurrence and, 4. The brief amounts of overland flow. Table II-2, Rainfall Intensity, shows kinetic energy by various rainfall amounts. Summer storms produce more runoff and erosion potential than gentler winter and spring rains.

PRELIMINARY
DRAFT

TABLE II-2
KINETIC ENERGY AND NUMBER OF DROPS FOR RAINFALL OF VARIOUS INTENSITIES

Precipitation Type	Precipitation Intensity (in./hr.)	Median Diameter (mm.)	Velocity of Fall (ft./sec.)	Drops per Square Foot (no./sec.)	Kinetic Energy (ft.lbs./sq.ft./hr.)
Light rain	0.04	1.24	15.7	26	0.797
Moderate rain	0.15	1.60	18.7	46	4.241
Heavy rain	0.60	2.05	22.0	46	23.47
Excessive rain	1.60	2.40	24.0	76	74.48
Cloudburst	4.00	2.85	25.9	113	216.9

NOTE: The estimated design storm depths for the Tonopah study area can be represented by precipitation types "heavy rain", and "excessive rain".

SOURCE: Howard W. Lull, Soil Compaction on Forest and Range Lands , U.S. Department of Agriculture, Forest Service, Miscellaneous Publication No. 768, 1959.

PRELIMINARY
DRAFT

Data from U.S. Weather Service stations at Tonopah and Adaven, depicted in Table II-3 , Precipitation Summary, shows precipitation distributed rather uniformly throughout the year, with peaks from March through May, and during December and January. Annual precipitation averages between four and six inches on valley floors below 5,000 feet, and up to about 25 inches per year at elevations above 9,000 feet. About 50 percent of the study area consists of valleys, alluvial fans, and foothills between 5,000 and 6,500 feet in elevation, which receive approximately six to eight inches mean annual precipitation. Average precipitation values tend to be misleading since actual amounts and intensities are highly variable, and periods of drought can significantly affect resource management programs. Table II-4, Precipitation Return Periods, shows seasonal precipitation amounts and return periods for storms in the area.

PRELIMINARY
DRAFT

TABLE II-3
PRECIPITATION SUMMARY

Station Name	Approximate Latitude (degrees north)	Mean elevation within 100 sq. mi. of station (ft.) MSL	Mean annual precipitation in station area	Years of record	Years of record needed for 80% confidence	No. days with > .1 inch	No. days with >.25 inch	Mean Monthly Precipitation (Standard deviations = total monthly rainfall.) 1/ J	F	M	A	M	J	J	A	S	O	N	D	Representative Distribution North or South
Adaven	38 7'	5,250**	12.8	30	5	38	25	1.0	1.0	1.2	1.2	1.0	0.7	1.3	1.6	1.0	1.0	0.9	1.0	S
Quinn Canyon Range	38 10'	9,000	20.0		7	56	35	1.6	1.5	1.8	1.9	1.5	1.0	2.0	2.5	1.5	1.5	1.4	1.6	S
Railroad Valley	38 30'	4,800	6.0		9	22	11	0.5	0.5	0.5	0.6	0.5	0.3	0.6	0.8	0.5	0.4	0.4	0.5	S
Pancake Range	38 30'	7,000	12.0		8	37	23	1.3	1.1	1.2	1.0	0.7	0.4	1.1	1.3	0.8	0.8	0.8	1.2	N
Hot Creek Valley	38 30'	5,300	6.0		8	22	11	0.5	0.5	0.5	0.6	0.5	0.3	0.6	0.8	0.5	0.4	0.4	0.5	S
Hot Creek Range	38 30'	8,000	16.0		9	48	31	1.8	1.5	1.6	1.3	1.3	1.0	1.5	1.8	1.1	1.1	1.0	1.6	N
Little Fish Lake Valley	38 45'	6,800	12.0		9	37	23	1.3	1.1	1.2	1.0	0.7	0.4	1.1	1.3	0.8	0.8	0.8	1.2	N
Stone Cabin Valley	38	6,000	8.0		9	26	15	0.6	0.6	0.7	0.8	0.6	0.4	0.8	1.0	0.6	0.6	0.6	0.6	S
Monitor Range	38 30'	9.000	20.0		9	55	35	2.2	1.9	1.9	1.6	1.2	0.7	1.8	2.2	1.4	1.3	1.3	2.0	N
Monitor Valley	38 45'	7,000	12.0		8	36	23	1.3	1.1	1.2	1.0	0.7	0.4	1.1	1.3	0.8	0.8	0.8	1.2	N
Ralston Valley	38 10'	5,800	8.0		9	25	15	0.6	0.6	0.7	0.8	0.6	0.4	0.8	1.0	0.6	0.6	0.6	0.6	S
Tonopah Airport	38 4'	5,426**	4.3	30	10	16	8	0.3	0.3	0.4	0.4	0.3	0.2	0.8	0.5	0.3	0.3	0.3	0.3	S
Toquima Range	38 45'	9,000	20.0		9	56	35	2.2	1.9	1.9	1.6	1.2	0.7	1.8	2.2	1.4	1.3	1.3	2.0	N
Smoky Valley Station	38 47'	5,625**	6.5	8	8	22	11	0.7	0.6	0.6	0.5	0.4	0.2	0.6	0.7	0.5	0.4	0.4	0.7	N
Ione Valley	38 45'	6,000	8.0		10	27	15	0.9	0.8	0.8	0.7	0.5	0.3	0.7	0.9	0.6	0.5	0.5	0.8	N
Toiyabe-Shoshone Valley	39	9,000	20.0		9	57	35	2.2	1.9	1.9	1.6	1.2	0.7	1.8	2.2	1.4	1.3	1.3	2.0	N
Big Smoky Valley	38 30'	5,500	6.0		8	22	11	0.5	0.5	0.5	0.6	0.5	0.3	0.6	0.8	0.5	0.4	0.4	0.5	S
Coaldale*	38	4,646**	3.3	13	10	12	6	0.2	0.1	0.2	0.5	0.4	0.1	0.4	0.3	0.1	0.4	0.3	0.3	S

Note: All data, including extrapolated data, has been adjusted statistically to a 30-year period of record (1930-1960).
* Source: World Climatic Data, 1972.
** Station Elevation.
1/ 10" snow = 1" water.

PRELIMINARY
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TABLE II-4
PRECIPITATION RETURN PERIODS AND DURATIONS

Allotment	Mean Annual Precipitation (inches)	2 yr. 1 hr. Precipitation (inches)	2 yr. 6 hr. Precipitation (inches)	2 yr. 24 hr. Precipitation (inches)	5 yr. 6 hr. Precipitation (inches)	5 yr. 24 hr. Precipitation (inches)	100 yr. 6 hr. Precipitation (inches)
Blue Eagle	6.0	0.5	0.9	1.0	1.0	1.4	2.1
Butterfield	6.0	0.6	0.9	1.4	1.0	1.5	2.2
Nyala	6.0	0.5	0.6	1.4	0.9	1.5	2.1
Reveille	5.0	0.4	0.5	1.3	0.8	1.3	1.6
Hot Creek	10.0	0.7	0.9	1.8	1.4	1.7	2.2
Wagon Johnnie	12.0	0.8	1.0	1.4	1.3	1.9	2.2
Stone Cabin	8.0	0.4	0.6	1.1	1.0	1.4	1.6
Ralston-Monitor	10.0	0.5	0.8	1.2	0.9	1.4	2.0
Hunts Canyon	14.0	0.6	1.1	1.6	1.5	2.0	2.2
Francisco	13.0	0.9	1.0	1 4	1.4	1.9	2.0
Darrough Hot Springs	7.0	0.5	0.6	1.0	0.9	1.4	1.6
Ione	8.0	0.4	0.6	1.1	1.0	1.4	1.6
Willow Creek	13.0	0.6	1.0	1.6	1.1	1.5	2.3
San Antone-Smoky	9.0	0.5	0.8	1.5	0.9	1.4	2.0

SOURCE: Bureau of Land Management, Nevada State Office, unpublished data for 9173 Manual, Studies and Hydrology, 1976.

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The Palmer Index Method of measuring wet and dry periods was used to identify 17 drought periods in south-central Nevada from 1931 to 1967. Illustrations II-3 and II-4, show the characteristics of drought and wet periods. The longest dry period occurred from November 1932, to September 1936, a total of 47 months. (Houghton, et al., Nevada's Weather, 1975.) About 54 percent of the area's droughts exceed six months; 32 percent exceed one year; 18 percent exceed four years, and four percent exceed four years in duration. (U.S.D.A., Central Nevada Land Use Plan, 1976). Illustration II-5, Drought Durations, shows the percent of drought events exceeding a given length in central Nevada.

In contrast to the drought periods mentioned above, 16 wet cycles occurred over the same 36-year period when precipitation was above normal. Probabilities for receiving selected rainfall amounts for a given one-, two-, or three-week period are shown in Appendix B.

PRELIMINARY
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Illustration II-3. Characteristics of Drought Conditions.

Illustration II-4. Characteristics of Wet Cycles.

PRELIMINARY
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Illustration II-5. Drought Durations, showing the percent of drought events exceeding a given length in central Nevada.

Temperature

Temperatures are extremely variable, with summer days often exceeding 90° F., then dropping to 40°-50° F. at night. Winter temperatures average in the mid-30's, with average minimums in the 10°-15° F. range. The highest temperature recorded in the study area was 110° F. in July 1972, at Diablo in Southern Railroad Valley. The record low was -25° F., also at Diablo. (Bureau of Land Management (BLM), Tonopah Unit Resource Analysis (URA), 1975.) The cooling effect of elevation on air temperatures causes a drop of about 2° F. per 1,000 feet in the valleys, and about 2.9° F., with every 1,000 feet in the mountains. The extreme southern portion of the study area averages about 2° F. warmer than the northern portion.

PRELIMINARY
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Growing Seasons

Growing seasons are determined by the number of days without frost. The average growing season for the study area lasts approximately 120 days, from about the first of June through the first of October. Growing seasons, like temperatures, are highly dependent on elevations and latitude. Table II-5 , Growing Seasons, shows the average number of frost-free days that can be expected three out of four years, or 75 percent of the time, The Growing Seasons map illustrates growing seasons throughout the area. (BLM, Tonopah URA, 1975.) A more detailed presentation of temperature and growing season probabilities at four representative locations is located in Appendix B under Temperature Data.

TABLE II-5
GROWING SEASON IN DAYS (32 Deg. F. 75% CHANCE)
AS A FUNCTION OF ELEVATION AND LATITUDE

Elevation*	Latitude (Deg. North) 38	38.25	38.50	38.75	39
5000	133	129	124	120	115
6000	117	112	108	103	99
6500	108	104	99	95	90
7000	100	95	91	86	82
7500	92	87	83	78	74
8000	83	79	74	70	65
8500	75	70	66	61	57
9000	67	62	58	53	49
9500	58	54	49	45	40
10000	50	46	41	36	32

After Sakamoto, et al. 1970.

*Caution should be used when applying these table values if the point is not more than 700 feet above the valley floor or if the area lies in the path of cold air drainage from mountain canyons. It should be noted that 75 percent chance growing season differs appreciably from 50 percent chance growing season published commonly.

PRELIMINARY
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GROWING SEASONS MAP

Growing seasons throughout the Tonopah Study Area are illustrated.

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Growing seasons are generally shorter on valley bottoms than on alluvial fans because cooled night air flows down-slope to the lowest elevations. Temperature inversions, or cold night air trapped near the ground by a layer of warm air above, are caused by rapid reradiation of heat at night which cools the surface. Minimum temperatures at the valley bottoms are commonly 5 to 10 degrees cooler than those on the slopes above the inversion layer, with up to 30° F., difference possible. Inversion layers tend to lie about 700 feet off the valley floor until they are dispersed by winds or warming daytime temperatures. Temperature inversions occur about 165 days per year, generally during November through January. (BLM, Tonopah URA, 1975.)

Frost alternation, or "freeze-thaw" phenomenon, occurs an average of over 200 days annually, or over 50 percent of the time. On these days the temperature drops below freezing, rises to thaw, then freezes again. This action places a more severe stress on biological and physical systems than would continuous freezing temperatures, and also weakens the mechanical strength of soil as coarse and fine materials are sorted by repeated freezing and thawing. It seems to have a greater effect in the absence of a snow cover. (Thornburg, Geomorphology, 1954.)

Wind

Prevailing surface winds in the Tonopah study area are from the northwest, and tend to reach their peak in April in close association with the Tonopah Lows. September apparently has the least wind. Heating and cooling affects local winds by producing downslope movement

of cooled mountain air at night, while warmed daytime air flows upslope. These air movements are generally lighter in the mornings than in the afternoons.

In summer, heated air near the ground can form tall whirlwind columns, or "dust devils", sometimes reaching over 1,000 feet into the air. Throughout the year locally intense winds and large dust devils may pick up topsoil, sand, or debris to cause dust storms which at times reduces visibility to one-half mile.

Wind combines with warm temperatures and low humidity to produce rapid evaporation of surface water and soil moisture. Humidity ranges from 20 to 30 percent in summer and up to 50 to 60 percent in winter. Evaporation rates from reservoir surfaces average from 52 inches per year in the northeast part of the study area, to about 58 inches per year in the southern portion. (Houghton, et al., Nevada's Weather, 1975.)

Table II-6 , Estimated Fastest Wind, shows how often high winds can be expected based on records from the Tonopah weather station.

PRELIMINARY
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TABLE II-6
ESTIMATED FASTEST WIND IN MILES PER HOUR FOR SELECTED RETURN PERIOD AT TONOPAH, NEVADA
(Period of Record 1906-1923)*

Return Period (Years)	Miles Per Hour
2	52
5	56
10	58
25	60
50	62
100	64

*After Thomas, et al., 1970.

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Air Quality

Air quality in the Tonopah study area is generally good. Monitoring stations have been established at Gabbs, just outside the western boundary, and at Tonopah to measure particulate matter (dust, smoke, or other fine suspended particles). The station on the Tonopah Hospital roof shows little fugitive dust from the surrounding area affecting the town, and no significant violations of the State Ambient Air Quality Standards of 150 micrograms per cubic meter (ug/m^3) in any one 24-hour period. (State of Nevada, 1975 Air Quality Report.) Illustration II-6 shows the fugitive dust readings at both monitoring stations from 1971 to 1975. Table II-7 shows the amounts and sources of fugitive dust emissions in the study area. Detailed air quality data for Tonopah and Gabbs is located in Appendix C.

Illustration II-6. Annual Geometric Means for Fugitive Dust at Air Quality Monitoring Sites for the Tonopah Study Area.

PRELIMINARY
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TABLE II-7
ESTIMATED ANNUAL FUGITIVE DUST
EMISSIONS FROM SIGNIFICANT SOURCES
IN TONOPAH STUDY AREA

Source Category	Emission Factor	Units Involved	Dust Emissions, Ton/Year Nye	Esmeralda	Total
Unpaved Roads	3.7 pounds/vehicle mile	4,134,000 vehicle miles/year	6,800	850	7,650
Agriculture	.41 tons/acre/year 1/	32,440 acres 2/	13,405	343	13,748
Tailings Piles (mines)	4-16 tons/acre/year, depending on climate	8 acres/year	45	2	47
Aggregate Storage	Sand-10 pounds/year/ton Gravel-1.5 pounds/year/ton	31,000 tons/year	90	negative	90
		TOTALS	20,340	1,195	21,535

1/ Factor based on wind erosion equations (see source listed below).
2/ Acreage figure from Tonopah Unit Resource Analysis.

SOURCE: Environmental Protection Agency, Investigation of Fugitive Dust - Sources, Emissions, and Control, Table F-5, 1973.

PRELIMINARY DRAFT

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Natural air pollution occurs in the form of duststorms, sandstorms, wildfire, and ozone generated during thunderstorms. Sunlight reacts with resins and sap from trees in heavily forested areas to produce a haze. Pollens fill the air at various times of the year. Yet, natural air pollution has always been counterbalanced by the atmosphere's natural cleansing action. Dusts drift, cluster together, and eventually settle or are washed out of the sky. Gases naturally convert to less harmful forms or oxidize and become attached to particles. Air Quality Control Section, Air Pollution in Nevada, 1974.)

During winter, stagnating air masses called anticyclones often remain over the region for two or more days preventing vertical atmosphere movement and thus causing atmospheric mixing depths to remain shallow. This condition is prevalent over Nevada from November through January. There is also a high frequency of occurrence of light wind speeds from October through January. These phenomena (stagnating anticyclones, shallow atmospheric mixing depths and light winds) all tend to help any potential air pollution to accumulate. However, because the area is virtually undeveloped and free of pollution sources, these conditions cause negligible impact.

Basic, Inc., located at Gabbs, processes magnesite and brucite which produces a locally visible whitist plume. This particular point source is being modified to meet Nevada's 24-hour standard. Illustration II-7 shows the percentage of particulate readings that violate state and federal standards, and the reductions required.

PRELIMINARY
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Illustration II-7. Percent of Particulate Reading Violating 150 ugm^3 24-Hour State Standard, Gabbs, Nevada.

Smoke is produced at most communities by home heating and trash burning, but has little or no overall effect on air quality standards. Carbon monoxide, hydrocarbons, and nitrogen oxides--assumed to be greater where there are concentrations of motor vehicles or engines--are presently not measured in the area.

Sulfur dioxide, hydrogen sulfide, and possibly methane are produced by some of the hot springs, but quantities are considered insignificant. (Bureau of Land Management, Tonopah Geothermal Environmental Analysis Record, 1975.)

Airborne radiological contaminants released in the 1950's during nuclear tests at the Nevada Test Site were recorded in the eastern portion of the study area. However, Energy Research and Development Administration, formerly the Atomic Energy Commission, and Environmental Protection Agency tests show radiation has returned to normal, pre-test levels.

Topography and Geology

The Tonopah study area lies within the Great Basin section of the Basin and Range physiographic province, a broad geographic area distinguished by its topography. The province is characterized by narrow, north-south trending mountain ranges with intervening alluvium-filled valleys. The topography is controlled by block faulting i.e., displacement of one block of earth or rock with respect to the other. The ranges have been uplifted and/or tilted along north-south trending normal faults, while the basins are underlain by down-faulted structural blocks. Older complex structures within the ranges are a secondary topographic influence. Valley floor centers frequently have playas (flat-floored bottoms of undrained desert basins where evaporation occurs), since drainage is confined to indivudual basins or to a series of interconnected basins. The southwest portion of the study area is located in the Walker Lane, a physiographic zone which trends northwest-southeast and has scattered fault block mountains lacking typical basin and range linearity.

Typical average gradients may be 50 feet per mile at the lower valley floors, 200 feet per mile at the valley-fill/bedrock contacts, and may reach 1,000 feet per mile in the mountains. For topographic relief, see the Tonopah Study Area Map. For contour elevations, see the Slope Map.

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TOPOGRAPHY AND GEOLOGY SLOPE MAP

Contour elevations are illustrated.

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Human presence in the area has been the result of mining, agriculture, and activities of similar scale which are considered minor when compared to the regional topography.

PRELIMINARY DRAFT

The rock types in the area range in age from Precambrian (more than 600 million years old) to Recent. Tertiary (three to 70 million years) volcanic rocks are common. Most of the volcanic rocks are silicic ignimbrites, sheet-like deposits of relatively non-sorted, non-stratified tuffaceous material. Lava flows, tuffaceous sediments, and intrusives are associated with the ignimbrites. Basalts of late Tertiary and Recent age occur locally, being most notable in the eastern portion of the study area in the Pancake Range, where cones, explosion craters, and lava flows are well preserved. Metasediments (schists, slates, quartzites, and limestones) and metavolcanics (greenstones) underlie the younger volcanics in most of the ranges. (Bureau of Land Management (BLM) Tonopah Unit Resource Analysis (URA), 1975.)

The western portion of the study area (west of the Monitor Range) lies under the upper plate of the Roberts Mountains Thrust. Subsequent deformation and erosion have caused localized removal of the plate, exposing rocks of the lower plate.

Alluvium that has washed into the valleys from adjacent ranges is often

several thousand feet thick in places. The transition from range to valley along some basin margins is indicated by a steeply-dipping fault scarp. Along other basin margins, the range front has erosionally retreated, leaving a gently sloping pediment (erosional of bedrock) buried by a thin veneer of alluvium.

The Basin and Range physiographic province is an area of high heat flow probably resulting from near-melting conditions in the upper mantle and lower crust of the earth. Hot springs, located along faults where groundwater can circulate at depth through the fractures to hot rock, are numerous in the study area. The recent vulcanism indicates the presence of relatively young, shallow magma bodies.

For general rock types in the study area and the depth to basement rock in the alluvial valleys, see the Generalized Geology Map.

PRELIMINARY
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GENERALIZED GEOLOGY MAP

General rock types and the depth to basement rock in the alluvial valleys for the Tonopah Study Area are illustrated.

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Seismic Activity

For a delineation of seismic risk zones in Nevada (and the United States), see the Seismic Risk Map. Seismic zone 2 denotes possible moderate structural damage and Seismic zone 3 denotes possible major structural damage that could result from earthquakes.

PRELIMINARY
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SEISMIC RISK MAP

Seismic risk zones in the United States are illustrated.

Soils

The soil resource is basic to all biological life and provides a living filter for the water resource within the study area. It is a renewable resource over a long span of time, while water and vegetation are renewable over the short-term. Soils are the products of the interaction of five factors: climate, time, parent material, topography, and living organisms. Soil provides physical support and supplies nutrients for vegetation. It regenerates itself by interaction with the total environment.

The soils of the study area are comprised of 50 associations (map units) of subgroups and their phases. Kinds of soils in each map unit and their properties appear in Appendix D, Table D-I. Some pertinent interpretations for each soil is shown in Appendix D, Table D-2. Table D-3 in Appendix D gives the acreage of each soil association (map unit) in the study area by allotment.

The following schematic map shows the extent of each map unit within the study area. The soils (and miscellaneous land types) have been grouped into six general areas, based primarily on landform and Great Group.

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SOILS MAP

Schematic soils map showing extent of each map unit in the Tonopah Study Area.

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PRELIMINARY DRAFT

The soils map has been compiled from previously completed soil surveys (Summerfield, Peterson, Reconnaissance Survey, Railroad Valley, 1971; Candland, Soil Survey, Big Smoky Valley, 1974; Mitchell, Soil Survey, Duckwater, 1974; U. S. Department of Agriculture (USDA), Soil Conservation Service (SCS), Soil Map, White Pine County, 1976 and Soil Map for Esmeralda County, 1976). Also, there was a synthesis of data from various geologic, vegetative, and climatic resources (Tueller et al., Ecology of Hot Creek, 1972 ; Nevada State Engineer's Office, Irrigible Soils of Nevada and Freeze Free (32° F) Seasons of the Major Basins and Plateaus, Water Resources Report No. 8, 1974 and Forecasts for the Future - Agriculture; Stewart and Carlson, Preliminary Geologic Map, Nevada, 1974; Snyder, Hardman, Zdenek, Pleistocene Lakes, 1964; USDA, U. S. Forest Service, Land Use Plan for Central Nevada Planning Unit, and Great Basin Region Comprehensive Framework Study - Appendix VI, Land Resources and Use and Appendix VIII, Watershed Management, 1971).

The soils of the Tonopah study area are of wide contrast. They span four soil orders of classification (USDA, Soil Taxonomy, 1975). The climate, geology, and vegetation vary considerably. Lone Mountain and the south tip and central part of the Toquima Range are composed of granitic bedrock; the San Antonio Mountains are composed of mixed sedimentary bedrock. The Monte Cristo Range is made up of andesite and rhyolite, and the Toiyabe and Hot Creek Ranges are compoased of basalt, volcanic ash, and tuffs.

The vegetation varies from barren on the playas to pinyon-juniper in the mountain ranges. The annual precipitation ranges from four inches at the lowest elevation to 20 inches at the highest elevation. The slope gradients range from 0 to 70 percent.

Table D-4 in Appendix D shows average sediment yields for the present, the future without the proposed action, and the future with implementation of the proposed action. These sediment yields are estimates calculated by the PSIAC Method (Pacific Southwest Interagency Committee, 1968). The accuracy of this method was evaluated (Shown, Geological Survey Research, 1970) by comparison with field methods. These sediment yield values compare favorably with those estimated by the Soil Conservation Service (USDA, Erosion, Sediment, Related Salt Problems and Related Salt Problems - Treatment Opportunities, Golden, Colorado, 1975), studies on similar soils and plant communities (Blackburn, Infiltration Rate, 1973) and Table D-5, Appendix D. Table D-6 in Appendix D indicates the potential range productivity of different soil subgroups in the study area. The potential productivity of each soil is an estimate of total vegetation (pounds per unit of dry weight) produced by each soil subgroup (and a few major phases, i.e. saline, cobbly) in accordance with soil-range site concept (Hugie, Soil-Climate-Vegetation Relations, 1962, and SCS, National Range Handbook, 1976).

Erosion Condition

Present erosion condition classes within the study area have been developed based on soil surface factors obtained from vegetative transect data (see map on Erosion Condition, Future and Present, under Current Management). Future erosion condition classes resulting after the implementation of the proposed action are shown on the Erosion Condition, Future, with Proposed Action Map. (Table II-18, Average Percent Ground Cover, indicates erosion condition and range condition by allotment.)

The most common natural occurring soil problems include wind and water erosion hazards due to slope, soil characteristics, climatic factors and parent material characteristics. Clayey textured soils have higher shrink-swell potentials, slower infiltration rates, and higher surface runoff values than coarser textured soils. Percent silt plus very fine sand of soils is an example of a soil property that influences the susceptibility to both water and wind erosion. Many of the soils and parent materials are saline and/or alkali and not conducive to plant growth. Soil compaction occurs through natural (i.e., raindrop impact, see Table II-2) cattle trampling and mechanical means, but cannot be quantified at present.

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EROSION CONDITION MAP

Present and future erosion condition under current management is shown.

PRELIMINARY
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Future erosion condition with implementation of Proposed Action.

Water Resources

Surface Water

Surface water is not abundant in the Tonopah study area, and with the exception of Big Smoky Valley, supplies only a small portion of the total water use budget. Ranchers utilize spring runoff flows for limited irrigation purposes, but can only do so in areas close to surface water sources because of relatively high infiltration and evapotranspiration rates. See the Annual Average Evaporation Map. Irrigation impoundments are reduced in their effectiveness because of these high water losses and because of rapid sedimentation in the impoundments. Sedimentation is most pronounced in those impoundments near canyon mouths.

PRELIMINARY
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AVERAGE ANNUAL EVAPORATION MAP

PRELIMINARY DRAFT

Evapotranspiration: Losses due to evapotranspiration occur until the groundwater has descended below the depth of the plant root systems. The losses to the atmosphere occur directly from ground or snow surfaces, from interception by plant foliage, from vegetal transpiration, and by evaporation from capillary action in the soil on the valley floors where the groundwater table is near the land surface.

Stream Flow and Runoff: Stream channels in the mountains tend to be straight, have steep hydraulic gradients, and contain large quantities of coarse material i.e., from gravels to small boulders. Some stream segments may be nearly vertical. The hydraulic gradient sharply diminishes as the stream courses leave the mountains. The stream channels then contain less coarse material (sands and gravels), reflecting the streams' reduced carrying capacity due to lower flow velocities. As the streams cross the pediment slopes at the base of the mountain ranges, they cut out channels to a lesser degree until remaining flows are absorbed in the playas at the valley centers.

Stream velocities are relatively high in the mountains, especially after short-duration, high-intensity summer thunderstorms, which may cause flash flooding. Snow melt causes less erosion and sedimentation in the lower elevations because it is discharged over a longer time period. Only during heavy thunderstorms and prolonged snowmelt runoff does much water reach the playas since rapid infiltration occurs on the pediment slopes flanking the ranges. Water losses that occur once the drainages

PRELIMINARY DRAFT

reach the low-gradient pediments and alluvial fans take the following forms: evaporation, transpiration, channel percolation, bank storage, channel storage, small impoundment storage, and recharge to groundwater reservoirs. Because of these high losses of surface water, most stream flow within the study area is ephemeral or intermittent.

The average annual runoff is low, ranging from less than one inch in most valley basins to an approximate maximum of 10 inches in high elevation areas that accumulate a winter snowpack. Runoff occurs when the precipitation rate or the snowmelt rate exceeds the soil infiltration rate. Generally, at least 12 inches of annual precipitation is necessary to produce dependable runoff or above the 8,000-foot elevation in this region. Most precipitation below that elevation goes toward satisfying the soil water deficit. Therefore, a drainage which supports a perennial stream usually has a sizeable portion (70 percent or more) of the drainage area situated above 8,000 feet, with a maximum elevation of 10,000 feet or more. Meadows, springs, and intermittent streams occur in areas with a lesser percentage of the drainage basin situated above 8,000 feet. (USDA, Central Nevada Land Use Plan, 1976.) See Table II-8, Surface Water Data.

PRELIMINARY
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TABLE II-8
HYDROLOGICAL SUMMARY - SURFACE WATER DATA

Hydrographic Area Name	Runoff from Mountains acre-feet/year	Surface Water Inflow acre feet per year	Surface Water Inflow From hydro area	Surface Water Evaporation acre-feet/year	Surface Water Outflow acre-feet per year	Surface Water Outflow To hydro area
Ione Valley	5,200	0			300	Big Smoky Valley
Big Smoky Valley						
Tonopah Flat	5,000	300	Ione Valley		0	
Northern part	38,000	0		Minor	0	
Monitor Valley						
Southern part	44,000	0			Some	
Ralston Valley	10,000	Some	Stone Cabin	Minor	0	
Stone Cabin Valley	9,700	0			Some	Ralston Valley
Little Fish Lake Valley	18,000	0		Some	0	
Little Smoky Valley						
Central part	Minor	0		Minor	0	
Southern part	1,500	0		Minor	0	
Railroad Valley						
Southern part	8,500	0		Minor	0	
Northern part	26,000	1,000		Minor	0	

Source: Water for Nevada, Report No. 3, 1971.

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All the drainage within the study area is internal. Only the larger stream channels have perennial stream flow. See the Water Resources Map; Table II-9, Stream Gage Stations; and Table II-10, Estimated Flows - Miscellaneous Stream Stations. Perennial flow usually occurs along short segments of a stream channel, often above the range front/pediment boundary. Slopes with western exposures often have greater flow volumes due to the effects of orographic lifting as weather systems move west to east over the mountain ranges. Prolonged runoff occurs in the spring and early summer (April to July) since most of the area's precipitation is received as snow from December through March (see Climate, Chapter II). This snowmelt runoff furnishes most of the annual groundwater recharge. Snowmelt from snowdrifts at the lower elevations, especially if they are large enough and on the lee sides of ridges, may also produce spring runoff.

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TABLE II- 9
STREAM GAGE STATIONS
TONOPAH STUDY AREA

Station Number	Station Name	Average Discharge Acre-feet/year	Drainage Area mile	Period of Record	Diversion above Station
10246846	Little Currant River near Currant, Nevada	2,330	12.9	9	No
10249280	Kingston Creek Cougar Canyon near Austin, Nevada	5,930	23.4	7	Yes
01249300	South Twin River near Round Mountain, Nevada	3,990	20.0	8	No
10325500	Reese River near Ione, Nevada	7,900	53	24	No

Source: BLM's Unit Resource Analysis of the study area, USGS water supply paper.

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TABLE II-10
ESTIMATED FLOWS - MISCELLANEOUS STREAM STATIONS

Stream Name	Ultimate Discharge Area	Annual Flow (A/F)
Fish Creek	Newark Valley	500
Hot Creek	Railroad Valley	1,200
Coils Creek Slough Creek Dagget Creek	Diamond Valley	--
Reese River	Humboldt River	150
Big Creek	Railroad Valley	1,000
Ox Spring	Railroad Valley	800
Johnson Canyon	Railroad Valley	170
Broom Canyon	Railroad Valley	140
Blackrock Canyon	Railroad Valley	150
Cathedral Canyon	Railroad Valley	80
Unnamed tributaries	Railroad Valley	620
Unnamed tributaries	Penoyer Valley	100
Birch Creek	Big Smoky Valley	1,400
Kingston Creek	Big Smoky Valley	4,700
Bowman Creek	Big Smoky Valley	1,600
Decker Creek	Big Smoky Valley	800
McLeod Creek	Big Smoky Valley	550
Summit Creek	Big Smoky Valley	600
Ophir Creek	Big Smoky Valley	1,100
North Twin River	Big Smoky Valley	3,000
South Twin River	Big Smoky Valley	4,000
Belcher Canyon	Big Smoky Valley	1,000
Broad Creek	Big Smoky Valley	1,000
Jeff Creek	Big Smoky Valley	1,600
Pablo Creek	Big Smoky Valley	2,200
Moore Creek	Big Smoky Valley	540
Barker Creek	Big Smoky Valley	900
Jefferson Creek	Big Smoky Valley	1,000
Shoshone Creek	Big Smoky Valley	200
Peavine Creek	Big Smoky Valley	2,800

Source: BLM's Unit Resource Analysis of the Study Area.

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WATER RESOURCES MAP

Location of surface water bodies and water coursed are illustrated.

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Perennial Lakes: The only perennial lake in the study area is Little Fish Lake in Little Fish Lake Valley. Occupying about 80 acres with a storage capacity of 160 acre-feet, the lake is fed by runoff flows and springs.

The lake has a maximum depth of eight feet and supports waterfowl, shorebirds, and a fish population. Fine silts and clays comprise the lake bottom. Rates of sedimentation have not been measured.

Sediment Transport: Sediment loads are generally low during most of the year because of the low frequency of runoff-producing storms. Sediment transport is caused primarily by summer thunderstorm runoff. Sediment yield is mainly derived from rill and channel erosion, the extent of which is dependent upon the duration and magnitude of peak discharge, the wetted perimeter of the channel, flow velocities, and channel stability. Deposition usually occurs before the runoff reaches the lower valley levels (with the exception of the finer particles--silt and clay). Snowmelt transports a lesser volume of sediment because of the lower unit volumes of such runoff. For discussion on sediment transport and erosion, see the Soils section of this chapter.

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Groundwater

Water supplies for domestic, industrial, livestock, and irrigation purposes in the Tonopah study area are obtained mainly from groundwater sources. See the General Distribution of Valley Groundwater Reservoirs Map, and the Static Groundwater Levels Map. Wells vary in type from modern deep wells with high-lift pumps to shallow, older wells. Precipitation within individual hydrographic basins supplies most of the groundwater recharge, except for Ralston and Stone Cabin Valleys where a large portion of the groundwater recharge comes from the underflow from adjacent valley groundwater systems. Precipitation events of less than 0.05 inch do not effectively contribute to groundwater recharge since most of the moisture is lost directly to evaporation due to interception by vegetation and litter.

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GENERAL DISTRIBUTION OF

VALLEY GROUNDWATER RESERVOIRS

MAP

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STATIC GROUNDWATER LEVELS MAP

Water in the valley-fill reservoirs occupies the intergranular pores in the zone of saturation and is flowing slowly from recharge areas to discharge areas. The amount of groundwater in storage in the hydrographic basins is many times the volume of the annual groundwater recharge and discharge in those basins. See the Principal Areas of Natural Groundwater Discharge, Map. Also see Table II-11, Annual Hydrologic Budget Data, and Table II-12, Hydrology Subsurface, which presents a summary of the subsurface hydrologic budget. The alluvial deposits that fill the valleys vary laterally in composition, thickness, and permeability. Therefore, some wells are able to produce only small quantities of water, while more favorably located wells produce large amounts of water with little drawdown. In general, those wells drilled near the mountain range/pediment boundary produce larger quantities of better quality water than those wells drilled at lower valley elevations.

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PRINCIPAL AREAS OF

NATURAL GROUNDWATER DISCHARGE

MAP

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TABLE II-11
ANNUAL HYDROLOGIC BUDGET DATA
TONOPAH STUDY AREA

	Average Annual Precipitation Acre-Feet x 10^3	Average Annual Recharge Acre-Feet x 10^3	Playa Evaporation Acre-Feet x 10^3	Evaporation Acre-Feet x 10^3	Pumping Springs Acre-Feet x 10^3	Remarks
Gabbs Valley	475	5.2	1.0	2.7	0.6	
Ralston Valley	410	16.2	-	2.5	0.15	
Stone Cabin Valley	447	16.0	-	1.5	0.52	
Smith Creek Valley	276	12.0	1.0	5.6	0.40	Irrigation 1000 acre-feet
Ione Valley	230	8.0	-	1.3	0.20	
Monitor Valley	510	21.3	0.2	9.3	2.5	Domestic stock 100 acre-feet
Antelope Valley	190	4.1	-	3.2	1.1	Domestic stock 100 acre-feet
Kobeh Valley	460	11.0	-	12.5	2.6	Domestic stock 100 acre-feet
Stevens Basin	8.5	0.2	-	-	-	
Upper Reese River Valley	700	37.0	-	62.0	3.0	
Railroad Valley	1200	52.0	3.8	77.8	14.0	Domestic stock 30.45 acre-feet
Penoyer Valley	270	4.3	-	3.8	-	Domestic stock 10 acre-feet
Big Smoky Valley	1320	79.0	2.7	67.4	12.9	Domestic stock 35 acre-feet
Little Fish Lake Valley	230	11.0	-	10.0	-	
Hot Creek Valley	390	7.0	-	4.6	0.60	Domestic stock 100 acre-feet
Little Smoky Valley	430	5.4	-	1.9	3.40	Domestic stock 100 acre-feet

Stream gage data: Upper Reese near Ione=10.5 cfs/yr.=7600 acre-feet e=36,000 acre-feet.
Upper Reese at mouth of Reese Canyon 150 acre-feet e=3000 acre-feet.
Drainage area Reese-400 square miles

Note: cfs = cubic feet per second

Source: BLM's Unit Resource Analysis for the study area.

TABLE II-12
HYDROLOGY, SUBSURFACE
TONOPAH STUDY AREA

Valley Name	Area Acres (in Thousands)	Estimated Storage (Acre-Feet x 10^3)	Annual Production (Acre-Feet x 10^3)	Annual Recharge (Acre-Feet x 10^3)	Annual Storage (Acre-Feet x 10^3)	Annual Evaporation (Acre-Feet x 10^3)	Annual Evaporation (Acre-Feet x 10^3)	Annual Underflow (Acre-Feet x 10^3)	Perennial Yield (Acre-Feet x 10^3)
Cabbs	736.0	1,600	0.60	5.0	4.4	2.7	1.0	-	5.0
Ralston	610.8	2,700	0.15	5.0	15.8	2.5	-	13.0	6.0
Stone Cabin	614.4	2,200	0.52	5.0	15.5	2.0	-	14.0	2.0
Smith Creek	359.0	1,500	0.40	12.0	10.0	5.6	1.0	-	10.0
Ione	309.0	1,300	0.20	8.0	3.0	1.3	1.3	3.0	3.0
Monitor	678.4	2,000	0.60	21.3	20.7	11.0	0.25	6.0	18.0
Antelope	291.8	1,200	0.10	4.1	4.0	4.2	-	-	4.0
Kobeh	570.0	2,700	0.10	17.0	10.9	15.0	-	-	16.0
Stevens Basin	11.5	50	-	0.2	0.2	-	-	-	0.5
Upper Reese	768.0	-0-	3.0	37.0	34.0	33.0	-	0.5	37.0
Railroad	1,771.3	6,000	2.5	58.5	56.0	76.2	3.8	-	75.0
Penoyer	458.0	2,200	-	4.3	4.3	3.8	-	-	5.0
Big Smoky	1,872.6	12,000	7.4	7.9	71.6	61.7	2.3	2.0	71.0

Source: BLM's Unit Resource Analysis for the study area.

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According to the hydrologic atlas of Nevada, significant groundwater reservoirs are located beneath Hot Creek Valley and Big Smoky Valley. Lesser, but sizeable, groundwater reservoirs are situated beneath Ralston Valley, Stone Cabin Valley, Monitor Valley, Little Fish Lake Valley, and Willow Creek Basin. The principal groundwater locations (where the average annual recharge is at least 5,000 acre-feet) within the study area are: Big Smoky, Ralston, Hot Creek, and Railroad Valleys. (Groundwater Resources - Information Series, Report 1, 1961.)

The estimated annual groundwater recharge from precipitation in Monte Cristo Valley (a 284 square-mile area) is 500 acre-feet, with an average annual precipitation of 94,000 acre-feet. The estimated average annual groundwater discharge by evapotranspiration is 400 acre-feet. The annual perennial yield is 400 acre-feet, and the transitional storage reserve is estimated at 140,000 acre feet. The average annual runoff (calculated at the mountain front bedrock-alluvium contact) reaching the valley fill is estimated to be 1,700 acre-feet. (Water Resources - Reconnaissance Series, Report 52, 1970.)

The Columbus Salt Marsh Valley (a 370 square-mile area) has a potential groundwater recharge from precipitation of 700 acre-feet per year, with an average annual precipitation of 100,000 acre-feet. The estimated average annual groundwater discharge by evapotranspiration is 4,000 acre-feet. The annual perennial yield is estimated to be 4,000 acre-feet. The average annual runoff reaching the valley fill is estimated at approximately 2,000 acre-feet. (Water Resources - Reconnaissance Series, Report 52, 1970.)

For a listing of the valley groundwater budgets and the valley interrelationships between groundwater inflow and outflow, refer to Table II-13 Groundwater Hydrologic Summary.

PRELIMINARY DRAFT

TABLE II-13
GROUNDWATER HYDROLOGIC SUMMARY

Valley Name	Approximate Altitude of Valley Floor	Groundwater Budget Acre-Feet/Year	Perennial Yield Acre-Feet/Year	Groundwater In Storage (Acre-Feet/Foot Thickness of Valley Fill)	Groundwater Inflow Acre-Feet/Year	From Valley	Groundwater Outflow Acre-Feet/Year	To Valley
Columbus Salt Marsh	4,600	4,000	4,000	5,300	200	Fish Lake, Big Smoky	0	
Monte Cristo	5,400	400	400	7,200	0		0	
Hot Creek	5,300	6,500	5,500	23,000	200	Little Fish Lake	Some	Railroad, Little Smoky
Little Fish Lake	6,600	10,000	10,000	8,000	0		200	Hot Creek
Ralston	5,600	8,000	6,000	27,000	3,000	Stone Cabin	5,500	Alkali Spring
Ione	6,000	6,000	2,500	13,000	0		2,000	Big Smoky
Smith Creek	6,100	10,000	10,000	15,000	0		0	
Monitor (southern part)	7,000	13,000	10,000	10,000	0		2,000	N. Monitor
Big Smoky Tonopah Flat Northern part	4,800 5,500	14,000 65,000	6,000 65,000	70,000 50,000	2,000 0	Ione	8,000 0	Clayton
Fenoyer (Sand Springs Valley)	5,000	5,000	5,000	22,000	0		0	
Railroad Southern part	4,900	--	--	21,000	--		1,000	Kawich
Stone Cabin	5,700	5,000	2,000	22,000	0		3,000	Ralston

Data Source: Water For Nevada, Report No. 3, 1971.

Groundwater production is much less than the available supply within the study area because of the small amount of water used for irrigation and the lack of heavily populated areas. The population centers, which include Tonopah, Manhattan, Gabbs, Round Mountain, and Warm Springs, do not have high municipal water requirements. For example, Tonopah consumes about 150 acre-feet of water annually (several hundred acre-feet are imported from Ralston Valley, but losses occur). Stone Cabin Valley west of Warm Springs uses about 25 percent of the available, sustained yield groundwater supply for irrigation purposes only, while groundwater pumping in other study area valleys is much less than the available supply. (See Hydrology, Subsurface, and Annual Hydrologic Budget Data tables.)

Water Developments

See the BLM's Tonopah Unit Resource Analysis (1975) for a list of Bureau of Land Management water developments and non-Bureau water developments within the Tonopah study area. Appendix D maps show the locations of these water developments.

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Water Quality

Waters at 36 separate locations were sampled by Bureau of Land Management (BLM) personnel in October 1976, for purposes of obtaining water quality information. The samples were then analyzed by Sierra Environmental Monitoring of South Lake Tahoe, California. This laboratory has been approved by the California Public Health Department for complete chemical and bacteriological analyses. The sampling sites and testing parameters were selected by BLM personnel. Total coliform, fecal streptococcus, turbidity, pH, and total dissolved solids testing was performed in a field laboratory established in Tonopah.

The samples were then transferred on ice and/or with appropriate preservatives to South Lake Tahoe where they were analyzed for the remaining parameters. The waters tested are generally suitable for livestock and irrigation use. See the following water quality tables (Tables II-14, II-15) for the test results. Also see Table II-16, Recommended Water Quality Standards, as formulated by the National Academy of Sciences and the National Academy of Engineering at the request of the Environmental Protection Agency. For the location of the sampling sites, see Water Quality Sampling Sites map. See Water Quality Appendix for data on Monitor Well as provided by the Energy and Research Development Administration formerly the Atomic Energy Commission.

There are no State of Nevada designated class A, B, C, or D waters specifically within the Tonopah study area at this time. The Nevada State Environmental Commission has made provision for future classification as the need arises and as additional information on waters is gathered. A listing of Nevada Water Quality Standards is available upon request by writing State Director (N-911), Bureau of Land Management, Room 3008, Federal Building, 300 Booth Street, Reno, Nevada 89509.

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WATER QUALITY SAMPLING SITES LOCATION MAP

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TABLE II- 14
WATER QUALITY

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Station Number	Location of Site	pH	Turbidity JTU	Total Dissolved Solids (mg/1)	Nitrate mg/1	Orthophosphate mg/1	Chloride mg/1	Calcium mg/1	Manganese mg/1	Potassium mg/1	Sodium mg/1	Sulfate mg/1
1	Darrough Hot Spring	9.1*	0.5	322	0.08	0.025	12	3	0.01	3	112	51
2	TION, R43E, Sec. 6	7.8	460	292	0.46	0.044	--	70	0.01	2	19	62
3	Moore's Creek	8.2	2.0	182	0.02	0.150	8	38	0.01	3	26	14
4	Little Fish Lake	9.6*	4,9	16,000**	0.10	0.125	1,558*	19	0.01	440	270	1,370*
5	Danville Creek	8.2	3.1	330	0.03	0.034	4	60	0.01	3	13	72
6	Side Hill Spring	7.8	0.1	185	0.62	0.035	10	28	0.01	5	26	16
7	Pott Hole Spring	7.8	3.0	146	0.90	0.010	8	21	0.01	1	28	16
8	Clear Creek	9.2*	0.7	248	0.30	0.007	3	60	0.01	2	8	35
9	TION, R49E, Sec. 20	7.4	0.4	248	0.02	0.011	4	49	0.01	3	16	39
10	Meadow Creek	8.2	2.4	256	0.04	0.050	5	55	0.07*	5	25	39
11	Jett Creek	8.2	1.6	74	0.12	0.013	1	21	0.40*	1	6	7
12	Charnock Spring	7.5	0.5	270	0.18	0.012	19	33	0.01	8	52	42
13	Coyote Hole	8.7	3.4	330	0.08	0.007	13	4	0.02	2	108	70
14	Eden Creek	7.6	4.4	92	0.02	0.017	3	17	0.01	2	13	5
15	Flowing Well No. 3	7.9	0.6	262	1.0	0.013	16	18	0.01	15	87	18
16	Longstreet Stream	8.4	4.5	100	0.40	0.015	4	6	0.01	0.2	36	9
17	Wildlife Area	7.9	0.8	775	0.05	0.003	23	58	0.01	25	106	84
18	Reveille Mill	8.5	0.4	122	0.64	0.015	6	8	0.01	0.2	36	11
19	Baxter Spring	8.2	0.8	310	0.33	0.015	7	68	0.01	2	13	53
20	Antelope Spring	7.8	0.8	132	0.78	0.055	8	11	0.01	7	28	39
21	Keystone Spring	--	1.2	--	0.21	0.002	11	69	0.01	2	11	--
22	Big Well	7.7	0.4	310	0.14	0.015	23	20	0.01	10	63	23
23	Flowing Well No. 2	--	0.5	--	0.58	0.016	10	17	0.01	10	49	--
24	Sandy Summit Spring	8.0	0.5	95	0.02	0.015	3	15	0.01	3	10	12
25	Troy Canyon Stream	8.2	0.8	302	0.02	0.002	4	72	0.01	3	15	42
26	Echo Canyon Reservoir	9.3*	340	1,460	0.08	--	247	17	0.63*	29	400	137
27	Corcoran Canyon Creek	8.0	33.0	105	0.23	0.10	3	10	0.06*	3	29	19
28	Simon Pipeline	7.6	0.2	490	0.05	0.003	44	88	0.01	1	47	58
29	T11N, R47E, Sec. 5	8.3	3.6	160	0.11	0.005	8	8	0.01	1	45	18
30	Liberty Spring	8.0	3.0	195	0.87	0.015	18	48	0.02	4	25	32
31	Coyote Spring	7.4	1.1	610	1.0	0.016	28	110	0.01	2	51	72
32	Pine Creek	8.6	2.0	42	0.03	0.032	1	8	0.01	1	46	5
33	Fang Spring	--	0.7	--	0.33	0.015	16	57	0.02	1	45	--
34	Mosquito Creek	8.2	4.0	65	0.04	0.054	2	11	0.01	2	9	9
35	Barley Creek	8.2	1.8	82	0.04	0.080	2	16	0.01	2	10	12
36	Willow Spring	7.6	1.4	372	0.12	0.027	40	27	0.01	3	60	53

Notes: * Parameter in excess of the recommended Environmental Protection Agency water quality limits for public drinking water.
** Value to high, but no standard has been given.
mg/1 equals milligrams per liter.
JTU means Jackson Turbidity Unit.

TABLE II-15
WATER QUALITY

PRELIMINARY DRAFT

Station Number	Location of Site	Total Coliform No./100 ml	Fecal Streptococcus No./100 ml	Bicarbonate Alkalinity mg/l	Carbonate Alkalinity mg/l	Temperature Celsius	Arsenic mg/l	Copper mg/l	Zinc mg/l	Date Sample Taken	Time of day 0-2400
1	Darrough Hot Spring	0	2	20	20	--	--	--	--	10/6/76	1230
2	T10N, R43E, Sec. 6	0	18,000*	--	--	--	--	--	--	10/6/76	1300
3	Moore's Creek	39	68	19	0	9.7	--	--	--	10/6/76	0845
4	Little Fish Lake	0	0	15	86	14	--	--	--	10/6/76	0940
5	Danville Creek	6	54	21	0	10	--	--	--	10/6/76	1032
6	Side Hill Spring	0	0	11	0	19	--	--	--	10/6/76	0805
7	Pott Hole Spring	0	0	9	0	17	--	--	--	10/6/76	1215
8	Clear Creek	10	4	18	2	12	--	--	--	10/6/76	1055
9	T10N, R49E, Sec. 20	0	0	19	0	11	--	--	--	10/6/76	1007
10	Meadow Creek	78	12	20	0	12.2	--	--	--	10/6/76	1715
11	Jett Creek	2	58	6	0	--	--	--	--	10/6/76	1400
12	Charnock Spring	0	0	13	0	--	--	--	--	10/6/76	1100
13	Coyote Hole	0	0	8	6	--	--	--	--	10/6/76	1500
14	Eden Creek	0	4	8	0	10	--	--	--	10/6/76	1545
15	Flowing Well No. 3	0	0	19	0	15	--	--	--	10/6/76	1330
16	Longstreet Stream	14	2	7	2	20	--	--	--	10/6/76	1230
17	Wildlife Area	34	25	42	0	17	--	--	--	10/6/76	1300
18	Reveille Mill	0	0	6	4	24	--	--	--	10/6/76	1500
19	Baxter Spring	0	0	18	0	15.3	--	--	--	10/6/76	1555
20	Antelope Spring	0	2	10	0	16.1	--	--	--	10/6/76	1500
21	Keystone Spring**	32	2	--	--	17	0.005	0.05	0.01	10/6/76	1410
22	Big Well	0	2	18	0	21	--	--	--	10/6/76	1400
23	Flowing Well No. 2	0	4	--	--	15	--	--	--	10/6/76	1330
24	Sandy Summit Spring	24	62	7	0	12	--	--	--	10/7/76	0930
25	Troy Canyon Stream	70	57	22	0	24	--	--	--	10/7/76	1110
26	Echo Canyon Reservoir	0	530	59	22	19	--	--	--	10/7/76	--
27	Corcoran Canyon Creek	400	106	15	0	3.9	--	--	--	10/7/76	-800
28	Simon Pipeline Spring	0	4	29	0	--	--	--	--	10/7/76	1130
29	T11N, R47E, Sec. 5	0	0	12	0	25	--	--	--	10/7/76	1235
30	Liberty Spring	27	0	10	0	--	--	--	--	10/7/76	1105
31	Coyote Spring	0	40	30	0	--	--	--	--	10/7/76	1035
32	Pine Creek	46	300	4	0	4.4	--	--	--	10/7/76	0820
33	Fang Spring	8	2	--	--	15	--	--	--	10/7/76	1130
34	Mosquito Creek	4	59	8	0	13	--	--	--	10/7/76	1225
35	Barley Creek	110	12	7	0	6.7	--	--	--	10/7/76	0900
36	Willow Spring	2	8	23	0	--	--	--	--	10/7/76	0945

Notes: * Parameter in excess of the recommended Environmental Protection Agency water quality limits for public drinking water.

** Keystone Spring was analyzed for arsenic, copper, and zinc because the water may be influenced by mine drainage.

mg is milligram.
ml is milliliter.

TABLE II-16
RECOMMENDED WATER QUALITY STANDARDS

PRELIMINARY DRAFT

Recommended Limits Set for the Parameters Tested - Public Drinking Water:

pH: 5.0 - 9.0
Turbidity: no standard
Total Dissolved Solids: 500 mg/1 is suggested, although no standard is set
Nitrate: 10 mg/1
Orthophosphate: no standard
Chloride: 250 mg/1
Calcium: no standard
Manganese: 0.05 mg/1
Sodium: no standard
Total Coliform: 20,000/100 ml - this is the limit to which treatment is effective in removing the organisms
Fecal Streptococcus: 2,000/100 ml
Bicarbonate Alkalinity: no standard
Carbonate Alkalinity: no standard
Sulfate: 250 mg/1
Temperature: no standard
Arsenic: 0.1 mg/1
Copper: 1 mg/1
Zinc: 5 mg/1

* General farmstead uses follow the Federal drinking water standards.

Recommended Limits Set for Livestock Use:

Nitrate plus Nitrite: 100 ppm
Manganese: no standard
Zinc: 25 mg/1
Arsenic: 0.2 mg/1
Copper: 0.5 mg/1
Soluble Salts: 3,000 mg/1 - Should be satisfactory for livestock under any circumstances

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Recommended Limits for Irrigation Water Use:

Temperature: no standard
Chloride: permissible concentrations depend upon crop type, environmental conditions, and management practices
Nitrate: no standard
pH: 4.5 - 9.0
Total Dissolved Solids: 500 mg/1 (no detrimental effects)
500 - 1,000 mg/1 (can be detrimental to sensitive crops)
1,000 - 2,000 mg/1 (adverse effects on many crops)
Manganese: 0.20 mg/1
Copper: 0.20 mg/1
Arsenic: 0.10 mg/1
Sodium: limits depend upon plant and soil types

Source: Ecological Research Series, Water Quality Criteria, 1972, National Academy of Sciences and National Academy of Engineering, EPA R3-73-033 (March, 1973).

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Vegetation

Soils, topography, climate, and vegetation combine to produce ecological zones between the high mountain areas and desert lowland. Similarly, sequences of vegetal cover types are found throughout the study area by traveling from valley bottoms to higher elevations. Vegetation varies from scattered salt tolerant shrubs on desert playas through many varieties of desert shrubs and grasses to scattered stands of conifers and mountain mahogany on the intermediate to steep mountain slopes.

In general, there is an altitudinal zonation of vegetation from increasing precipitation and decreasing temperature with an increase in altitude. There are also zones of vegetation that represent responses to increasing concentration of soil salts proceeding from higher to lower elevations. These two factors, altitudinal effects and salinity effects, generally parallel each other as one descends into each of the closed basins of the study area. In addition to increased aridity and salinity with the descent into each basin, soil particle sizes tend to become smaller in the playas, resulting in higher moisture contraints. These conditions, in combination, often preclude vegetative growth. Local areas, such as those occupied by wind-blown sand and certain geologic materials provide exceptions to this generalization.

Aquatic vegetated areas are limited within the subject area, being confined to small perennial streams, spring areas, water impoundments, and one natural lake.

The following narrative identifies the 16 broad subtypes found in the Tonopah study area. These vegetative types, as depicted on the Vegetation Map, were typed

by aspect (apparent dominant vegetation), in accordance with Bureau of Land Management (BLM) Phase One Watershed Inventory. Table II-17, Vegetative Types, lists acres, percent of total acres covered by type, major species, and percent composition of major species. Table II-18 (Average Percent Ground Cover) gives percent ground cover by vegetative sub-type by allotment.

VEGETATIVE SUB-TYPES MAP FOR THE TONOPAH STUDY AREA

PRELIMINARY
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TABLE II- 17
VEGETATIVE TYPES

Sub-type	Acres	Percent of total area	Density	Major Species	Percent Composition
Short Grass (011)	16,442	<1%	13%	Hija	34%
				Orhy	27%
				Save	12%
				Atca	10%
				Atco	5%
				Other	12%
Bunch Grass (012)	35,716	1%	12%	Agde	33%
				Orhy	13%
				Spcr	13%
				Eula	6%
				Save	9%
				Atca	3%
				Chvi	3%
				Arsp	2%
				Sihy	2%
				Elci	1%
				Other	14%
Sod Grass (013)	3,868	<1%	9%	Dist	52%
				Chvi	20%
				Spai	15%
				Other	13%
Perennial Forbs (031)	6,094	<1%	12%	Spco	55%
				Chvi	20%
				Hagl	11%
				Other	14%
Annual Forbs (183)	7,298	<1%		Hagl	97%
				Atca	1%
				Eula	1%
				Atco	1%

PRELIMINARY DRAFT

TABLE II- 17
VEGETATIVE TYPES (CONT.)

Sub-type	Acres	Percent of total area	Density	Major Species	Percent Composition
Big Sage (041)	318,789	8%	21%	Artr	59%
				Atco	7%
				Chvi	7%
				Hija	6%
				Spne	2%
				Arno	2%
				Save	1%
				Eula	1%
				Juos	1%
				Other	14%
Black Sage and Low Sage (043)	624,293	15%	19%	Arno	60%
				Artr	5%
				Chvi	5%
				Atco	4%
				Pimo-Juos	2%
				Hija	2%
				Orhy	2%
				Arar	2%
				Epne	1%
				Save	1%
				Stco	1%
				Agsm	1%
				Other	14%
Rabbitbrush (045)	150,001	4%	19%	Chna	59%
				Atco	10%
				Save	4%
				Hija	3%
				Spai	2%
				Dist	2%
				Eula	2%
				Artr	2%
				Grsp	1%
				Other	15%

PRELIMINARY
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TABLE II-17
VEGETATIVE TYPES (CONT.)

Sub-type	Acres	Percent of total area	Density	Major Species	Percent Composition
Mountain Mahogany (056)	8,524	<1%	19%	Cele	25%
				Agsm	19%
				Grsp	16%
				Arno	10%
				Other	30%
Pinyon-Juniper (091)	399,948	10%	23%	Pimo-Juos	42%
				Arno	30%
				Artr	6%
				Arar	4%
				Chvi	1%
				Save	1%
				Epne	1%
				Other	15%
Shadscale (131)	1,011,336	25%	15%	Atco	54%
				Save	7%
				Hija	7%
				Arsp	4%
				Chvi	4%
				Arno	2%
				Eula	2%
				Tegl	2%
				Orhy	1%
				Other	17%
Fourwing Saltbush (134)	61,978	2%	17%	Atca	43%
				Chvi	15%
				Hija	12%
				Atco	4%
				Eula	4%
				Other	22%

PRELIMINARY
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TABLE II- 17
VEGETATIVE TYPES (CONT.)

Sub-type	Acres	Percent of total area	Density	Major Species	Percent Composition
Black Greasewood and Bailey's Greasewood (141)	1,086,319	27%	19%	Save	60%
				Atco	11%
				Chvi	6%
				Atca	3%
				Hija	2%
				Dist	2%
				Artr	2%
				Eula	1%
				Epne	1%
				Other	12%
Winterfat (151)	43,817	1%	13%	Eula	59%
				Chvi	13%
				Atco	8%
				Arsp	4%
				Orhy	2%
				Hagl	2%
				Artr	1%
				Atca	1%
				Other	10%
Horsebrush (164)	182,395	5%	20%	Tegl	16%
				Grsp	13%
				Hija	8%
				Save	5%
				Atco	5%
				Epne	4%
				Orhy	4%
				Hagl	4%
				Eula	2%
				Artr	1%
				Chvi	6%
				Atca	1%
				Other	31%
Other (Dry Lake) (Saline Flat) (Sand Dune) (Lava Flow)	78,140	2%			

PRELIMINARY DRAFT

PRELIMINARY DRAFT TABLE II-18

AVERAGE PERCENT GROUND COVER BY VEGETATION SUBTYPE

Allotment	Percent of Allotment Vegetative Subtype Composes	Vegetation Subtype	Ground Cover in Vegetation Subtype: Percent Vegetation	Percent Litter	Percent Small Rock	Percent Large Rock	Percent Bare Ground
Blue Eagle	6	Bunchgrass	7 a/	13	0	0	80
	10	Pinyon-juniper	22	7	34	17	20
	28	Shadscale	16	7	20	0	57
	56	Greasewood	14	6	3	0	76
	Total percent		15 b/	7	11	2	65
Butterfield	10	Black sage	17	5	40	17	21
	22	Pinyon-juniper	22	7	34	17	20
	3	Shadscale	16	7	20	0	57
	34	Greasewood	14	6	3	0	76
	Total percent		17	6	19	8	49
Nyala	16	Black sage	17	5	40	17	21
	1	Rabbitbrush	15	4	5	0	76
	1	Pinyon-juniper	34	8	33	4	21
	23	Shadscale	14	7	23	1	55
	36	Greasewood	11	4	7	0	78
	1	Winterfat	13	11	2	0	74
	15	Horsebrush	16	6	12	3	63
	1	Annual Forbs	35	5	15	0	45
	Total percent		12	4	15	3	54
Reveille	18	Big sage	19	15	48	3	15
	7	Black sage	22	17	45	6	10
	3	Rabbitbrush	18	19	29	2	32
	1	Shortgrass	11	9	57	0	23
	1	Bunchgrass	11	16	10	0	63
	12	Pinyon-juniper	25	16	34	14	11
	44	Shadscale	16	16	45	2	21
	3	Fourwing saltbush	14	23	22	0	41
	4	Greasewood	17	13	39	2	29
	1	Winterfat	10	15	55	0	20
	5	Horsebrush	16	15	38	2	29
	Total percent		17	15	42	4	19
Hot Creek	9	Big sage	26	10	12	3	49
	20	Black sage	19	8	30	17	26
	6	Rabbitbrush	22	7	21	1	49
	1	Mountain mahogany	19	4	46	28	3
	27	Pinyon-juniper	26	11	20	12	31
	28	Shadscale	15	9	24	5	47
	4	Greasewood	19	6	23	0	52
	3	Winterfat	17	9	13	1	60
	2	Horsebrush	22	10	13	3	52
	Total percent		20	9	22	8	39

PRELIMINARY DRAFT TABLE II- 18

AVERAGE PERCENT GROUND COVER BY VEGETATION SUBTYPE

Allotment	Percent of Allotment Vegetative Subtype Composes	Vegetation Subtype	Ground Cover in Vegetation Subtype: Percent Vegetation	Percent Litter	Percent Small Rock	Percent Large Rock	Percent Bare Ground
Wagon Johnnie	14	Bunchgrass	9	19	1	0	71
	6	Big sage	18	16	11	1	55
	64	Black sage	18	13	22	6	41
	16	Pinyon-juniper	23	9	29	13	26
	Total percent		18	12	19	8	41
Stone Cabin	20	Big sage	21	14	25	1	39
	15	Black sage	20	10	42	7	21
	15	Rabbitbrush	16	8	28	1	47
	22	Pinyon-juniper	29	13	30	11	17
	18	Shadscale	15	11	27	3	44
	5	Fourwing saltbush	19	14	21	0	46
	1	Greasewood	23	11	0	0	66
	1	Winterfat	18	11	0	0	71
	3	Horsebrush	21	9	18	0	52
	Total percent		21	11	28	3	34
Ralston-Monitor	3	Shortgrass	13	21	14	0	52
	1	Bunchgrass	8	17	1	1	73
	1	Perennial forbs	12	14	65	0	9
	6	Big sage	27	18	15	1	39
	30	Black sage	22	10	29	5	34
	5	Rabbitbrush	20	10	19	0	51
	2	Pinyon-juniper	19	13	24	19	25
	29	Shadscale	20	8	31	4	37
	16	Greasewood	19	6	33	3	39
	1	Winterfat	11	25	4	0	60
	6	Horsebrush	15	12	15	2	56
	1	Annual forbs	39	13	4	0	44
	Total percent		19	10	25	3	40
Hunts Canyon	1	Big sage	27	35	8	0	30
	37	Black sage	20	12	45	4	19
	6	Pinyon-juniper	13	14	40	7	26
	4	Shadscale	18	9	43	1	29
	24	Greasewood	23	16	23	7	31
	22	Fourwing saltbush	15	13	4	0	68
	3	Winterfat	8	23	1	0	68
	3	Horsebrush	15	12	15	2	56
	Total percent		17	11	41	2	26
Francisco	18	Big sage	19	15	17	0	49
	65	Shadscale	11	13	35	0	41
	7	Greasewood	14	5	34	2	45
	10	Winterfat	9	5	7	0	79
	Total percent		12	12	29	0	47

TABLE II- 18

AVERAGE PERCENT GROUND COVER BY VEGETATION SUBTYPE

Allotment	Percent of Allotment Vegetative Subtype Composes	Vegetation Subtype	Ground Cover in Vegetation Subtype				
			Percent Vegetation	Percent Litter	Percent Small Rock	Percent Large Rock	Percent Bare Ground
Darrough Hot Springs	21	Sodgrass	9	9	0	0	82
	28	Big sage	19	15	17	0	49
	20	Rabbitbrush	27	10	0	0	63
	10	Shadscale	11	13	35	0	41
	21	Greasewood	14	5	34	2	45
	Total percent		17	10	15	1	57
Ione	1	Bunchgrass	16	9	9	0	66
	15	Big sage	15	10	9	1	65
	24	Black sage	18	9	12	2	59
	3	Pinyon-juniper	21	6	14	1	58
	4	Shadscale	14	15	11	0	60
	52	Greasewood	17	9	16	1	57
	3	Winterfat	9	6	8	0	77
	Total percent		17	9	12	1	59
San Antone - Smoky	1	Big sage	17	13	21	2	47
	5	Black sage	22	8	25	3	42
	1	Rabbitbrush	27	10	0	0	63
	1	Pinyon-juniper	23	11	23	12	31
	24	Shadscale	11	11	32	3	44
	62	Greasewood	16	6	28	3	47
	1	Winterfat	9	5	7	0	79
	5	Horsebush	13	7	36	3	41
	1	Bunchgrass	15	17	1	0	67
	Total percent		15	7	26	2	46

a/ All sub-type ground cover percentages are unweighted averages.

b/ All total allotment ground cover percentages are weighted averages.

PRELIMINARY DRAFT

The vegetative type table was derived from several field data sheets which were grouped by subtype. Each species composition was averaged to result in a single species composition for the entire study area. Riparian vegetation or small meadows are not shown on the map or tables because of limited acreages and map scales, they are, however, discussed under the Wildlife section.

The subtypes listed below are in descending order of acres occupied.

PRELIMINARY DRAFT

Greasewood

The greasewood subtype is the largest type, occupying about twenty-seven percent of the study area. This subtype is prevalent on alluvial fans, valley plains, and low lake terraces. Shadscale and rabbitbrush are the next two most prominent plants associated with greasewood. Grass understory consists of mainly Galleta grass and saltgrass.

Shadscale

Shadscale is the second most common subtype, occupying about twenty-five percent of the study area. This subtype is generally found below the 6,500 foot elevation on lower valley floors where annual precipitation is four to six inches. It occurs mostly on the lower foothill lands and alluvial fans of the mountain ranges. Grass understory (underlying layer of low vegetation) consists mainly of Galleta grass and Indian ricegrass.

Black Sagebrush and Low Sagebrush

This subtype covers approximately 15.7 percent of the study area. It occurs where the soils are usually moderately deep and well drained. It is prevalent below the pinyon-juniper subtype on the gentle to steep mountain slopes and usually above the 6,500 foot elevations. Occasionally big sagebrush will be prominent in draws. Grass species found in this subtype are Galleta grass, Indian ricegrass, needle and thread, and western wheatgrass.

Pinyon-Juniper

PRELIMINARY DRAFT

This subtype covers approximately 10 percent of the study area and is most often found above the 6,500 foot elevations on gently sloping (four percent) to steep (50 percent) mountain slopes. The soils are generally stony. It occurs mostly on the south and west facing slopes, but does occur, regardless of aspect, in favorable soil-moisture relationships. Black sage, big sage, and low sage are found scattered throughout, with understory of sandberg bluegrass, squirreltail, Galleta grass, and Indian ricegrass.

Big Sagebrush

Big sagebrush subtype covers approximately eight percent of the study area and is found primarily from 4,600 to 7,500 feet. Favorable precipitation ranges from four to ten inches. At higher elevations where precipitation is greater, the slopes increase to as high as 50 percent. At the lower elevations where annual precipitation is six inches or less, the big sagebrush subtype receives extra run-on waters.

Associated plants are fourwing saltbrush and rabbitbrush. Understory is Galleta grass, rye, squirreltail, Indian ricegrass, and Sandberg bluegrass.

Horsebrush

This vegetative subtype covers approximately five percent of the study are and comprises horsebrush, spiny hopsage aspect. The biggest block of this subtype is in Railroad Valley southeast of Lunar Crater on low hills in the 5,200 to 6,500 foot elevations.

Associated plants are shadscale, greasewood, Indian ricegrass, and rabbitbrush.

PRELIMINARY DRAFT

Rabbitbrush

This subtype occupies about four percent of the study area and is most prominent in the Stone Cabin and Hot Creek Valleys. It occurs on elevations from 5,500 to 5,900 feet where the soils are strongly saline-alkali. Associated plants are shadscale, greasewood, Galleta grass, alkali grass, saltgrass and winterfat.

Fourwing Saltbrush

This subtype covers about two percent of the study area and occurs between 5,000 to 5,600 foot elevations. It is found on mostly alluvial fans and above playas where runoff is slow, and where it is not protected from winds. This subtype is pronounced where Ralston Valley and Stone Cabin Valley meet at Monitor

Peak. Associated plants are shadscale, rabbitbrush, Galleta grass, and winterfat.

Winterfat

This subtype occupies one percent of the study area along moderately sloping alluvial fans and drainages. Although winterfat can be found on most of the subtypes, it is conspicuous in Ralston Valley and along Hot Creek. Associated plants are rabbitbrush, shadscale, budsage, Indian ricegrass, big sage, and Galleta grass.

PRELIMINARY
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Bunchgrass

This subtype occupies approximately one percent of the study area. This subtype contains the crested wheatgrass seedings in Little Fish Lake Valley (16,000 acres) and Monitor Valley (2,736 acres). The seedings in Little Fish Lake were completed in 1971 on the east side and in 1974 on the west side. The seedings in Monitor Valley were completed in 1962 (2,131 acres) and 1968 (2,523 acres).

Short grass

This subtype occupies less than one percent of the study area and occurs mostly along the north and east sides of Monitor Peak. The major plants found in this subtype are Galleta grass, Indian ricegrass, some scattered greasewood, fourwing saltbush, shadscale, and sand dropseed.

Mountain Mahogany

This subtype occupies only one area in a large enough stand to be aspect typed

It occupies less than one percent of the study area occuring on the Pancake Range just north of U.S. Highway 6. Associated plants are western wheatgrass, spiny hopsage, and black sage.

Annual forbs

This subtype covers four percent of the study area. Ninety-seven percent of the species composition in this subtype is halogeton (Halogeton glomerata). The remaining three percent of the vegetative species are fourwing saltbrush, winterfat, and shadscale. Some 3,680 acres are fenced inside a desert land entry and the remaining 2,434 acres are on the east side of Monitor Peak in the valley.

PRELIMINARY DRAFT

Perennial forbs

This subtype occupied less than one percent of the study area occurring in only two locations. The biggest area is at the mouth of the Northumberland Canyon just below the forest boundary in Monitor Valley. This subtype is characterized by globemallow and is associated with rabbitbrush.

Sodgrass

This subtype occupies less than one percent of the study area. The major grass is saltgrass which occurs in one major spot, in the Big Smoky Valley around Darrough Hot Springs. Associated plants are rabbitbrush and alkali sacaton. This subtype probably occurs here because of the high water table and high alkaline effect which tends to override the soils effect where the greasewood borders.

For a complete listing of common vegetative species found in the Tonopah study area, see Appendix E, Vegetation.

PRELIMINARY DRAFT

Range Condition

Range condition refers to the health or production of a range in relation to the amount of desirable (or intermediate desirable) species of vegetation it produces and its watershed condition rating. The Range Condition, Cattle; Range Condition, Sheep; and Range Condition, Horses, Maps show these relationships in the Tonopah study area. Table II-19 gives range conditions by allotment. For all classes of livestock, the study area shows 51 percent (acres) rated poor; 40 percent rated fair (acres); and 8 percent (acres) rated good.

Although there is little data available to rate ecological range condition, a few generalities can be drawn using watershed soil surface (SSF) factors and range condition for cattle, sheep, and horses. The soil surface factor is a watershed inventory in which a numerical rating is assigned an area. This indicates a range of quality.

Generally, 27 percent of the area is rated with 41 SSF (moderate) or above, and 51 percent is rated poor for all three classes of livestock. See glossary for further explanation of SSF.

From these data it is assumed that 14 percent of the area is below the moderate or medium ecological range condition.

Considering that 72 percent of the area is rated with a SSF of 41 and below, and 43 percent of the area is rated as fair to good, it follows that 31 percent of the area is above the moderate or median ecological range condition. (See Table II-19, Vegetation, Watershed and Range Condition, which shows the range condition for each class of livestock by allotment.)

PRELIMINARY DRAFT

PRELIMINARY DRAFT

TABLE II- 19
VEGETATION, WATERSHED, AND RANGE
CONDITION BY ALLOTMENT

Allotment (NRL Only)	Vegetation Subtype	Percent	Watershed Erosion Class	Percent	Range Condition Class Cattle	Percent	Sheep	Percent	Horses	Percent
Blue Eagle	Greasewood	56	Slight	54	Good	0	Good	13	Good	0
	Shadscale	28	Moderate	46	Fair	30	Fair	24	Fair	32
	Pinyon-Juniper	10			Poor	58	Poor	51	Poor	56
	Bunchgrass	6			Barren	12	Barren	12	Barren	12
Butterfield Springs	Greasewood	34	Stable	0	Good	0	Good	0	Good	0
	Shadscale	3	Slight	79	Fair	37	Fair	52	Fair	45
	Black Sagebrush	10	Moderate	21	Poor	63	Poor	48	Poor	55
	Big Sagebrush	3								
	Pinyon-Juniper	22								
	Rabbitbrush	4								
	Sod Grass	<1								
	Perennial Forb	<1								
	Barren	23 a/								
Nyala	Greasewood	36	Stable	3	Good	8	Good	6	Good	7
	Shadscale	23	Slight	67	Fair	31	Fair	48	Fair	32
	Black Sagebrush	16	Moderate	23	Poor	61	Poor	46	Poor	61
	Pinyon-Juniper	<1	Unclassified	7						
	Horsebrush	15								
	Rabbitbrush	1								
	Winterfat	1								
	Annual Forbs	1								
	Barren	7								
Reveille	Greasewood	4	Stable	1	Good	1	Good	1	Good	1
	Shadscale	44	Slight	68	Fair	8	Fair	17	Fair	8
	Black Sagebrush	7	Moderate	30	Poor	91	Poor	82	Poor	91
	Big Sagebrush	18								
	Pinyon-Juniper	12	Unclassified	1						
	Horsebrush	5								

PRELIMINARY DRAFT

TABLE II-.19
VEGETATION, WATERSHED, AND RANGE CONDITION BY ALLOTMENT

Allotment (NRL Only)	Vegetation Subtype	Percent	Watershed Erosion Class	Percent	Range Condition Class Cattle	Percent	Sheep	Percent	Horses	Percent
Reveille	Rabbitbrush	3								
	Four Wing	3								
	Winterfat	1								
	Bunchgrass	<1								
	Short Grass	<1								
	Perennial Forbs	<1								
	Barren	1								
Hot Creek	Greasewood	4	Stable	10	Good	17	Good	12	Good	14
	Shadscale	28	Slight	63	Fair	36	Fair	55	Fair	39
	Black Sagebrush	20	Moderate	27	Poor	47	Poor	33	Poor	47
	Big Sagebrush	9	Critical	<1						
	Pinyon-Juniper	27	Unclassified	<1						
	Rabbitbrush	6								
	Horsebrush	2								
	Winterfat	3								
	Mountain Mahogany	1								
	Barren	<1								
Wagon Johnnie	Black Sagebrush	64	Stable	12	Good	23				
	Big Sagebrush	6	Slight	58	Fair	8	Unclassified		Unclassified	
	Pinyon-Juniper	16	Moderate	29	Poor	69				
	Bunchgrass	14	Critical	1						
Stone Cabin	Greasewood	<1	Stable	2	Good	13			Good	4
	Shadscale	18	Slight	86	Fair	42	Unclassified		Fair	47
	Black Sagebrush	15								
	Big Sagebrush	20	Moderate	12	Poor	45			Poor	49
	Pinyon-Juniper	22								
	Horsebrush	3								
	Rabbitbrush	15								
	Four Wing	5								
	Winterfat	<1								
	Barren	<1								

PRELIMINARY DRAFT

TABLE II- 19
VEGETATION, WATERSHED, AND RANGE CONDITION BY ALLOTMENT

Allotment (NRL Only)	Vegetation Subtype	Percent	Watershed Erosion Class	Percent	Range Condition Class Cattle	Percent	Sheep	Percent	Horses	Percent
Ralston-Monitor	Greasewood	16	Stable	18 b/	Good	14	Good	14 b/	Good	14 b/
	Shadscale	29	Slight	70	Fair	30	Fair	69	Fair	30
	Black Sagebrush	30	Moderate	10	Poor	56	Poor	17	Poor	56
	Big Sagebrush	6								
	Pinyon-Juniper	2	Critical	2						
	Horsebrush	6								
	Rabbitbrush	5								
	Winterfat	<1								
	Bunchgrass	1								
	Shortgrass	3								
	Perennial Forbs	1								
	Annual Forbs	<1								
Hunts Canyon	Greasewood	24	Stable	89	Good	6	Good	12	Good	6
	Shadscale	4	Slight	7	Fair	17	Fair	80	Fair	17
	Black Sagebrush	37	Moderate	4	Poor	77	Poor	8	Poor	77
	Big Sagebrush	<1								
	Pinyon-Juniper	6								
	Horsebrush	3								
	Rabbitbrush	<1								
	Four Wing	22								
	Winterfat	3								
Francisco	Greasewood	7	Stable	0	Good	0	Good	0	Good	0
	Shadscale	65	Slight	100	Fair	75	Fair	55	Fair	72
	Big Sagebrush	18			Poor	25	Poor	25	Poor	28
	Winterfat	10								

TABLE II-19
VEGETATION, WATERSHED, AND RANGE
CONDITION BY ALLOTMENT

Allotment (NRL Only)	Vegetation Subtype	Percent	Watershed Erosion Class	Percent	Range Condition Class Cattle	Percent	Sheep	Percent	Horses	Percent
Darrough Hot Springs	Greasewood	21	Stable	0	Good	0	Good	20	Good	0
	Shadscale	10	Slight	0	Fair	65	Fair	37	Fair	50
	Big Sagebrush	28	Moderate	100	Poor	35	Poor	34	Poor	50
	Rabbitbrush	20								
	Sodgrass	21								
Ione	Greasewood	52	Stable	68	Good	1	Good	7	Good	1
	Shadscale	4	Slight	30	Fair	35	Fair	62	Fair	35
	Black Sagebrush	24								
	Big Sagebrush	13	Moderate	2	Poor	64	Poor	31	Poor	64
	Pinyon-Juniper	3								
	Winterfat	3								
	Bunchgrass	1								
San Antone-Smoky	Greasewood	62	Stable	<1	Good	2	Good	18 b/	Good	4 b/
	Shadscale	24	Slight	50	Fair	70	Fair	54	Fair	56
	Black Sagebrush	5	Moderate	30	Poor	28	Poor	28	Poor	40
	Big Sagebrush	<1	Critical	13						
	Pinyon-Juniper	1	Barren	6						
	Horsebrush	5								
	Rabbitbrush	<1								
	Winterfat	<1								
	Bunchgrass	1								
	Barren	1								

PRELIMINARY
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TABLE II- 19
VEGETATION, WATERSHED, AND RANGE
CONDITION BY ALLOTMENT

Allotment (NRL Only)	Vegetation Subtype	Percent	Watershed Erosion Class	Percent	Range Condition Class Cattle	Percent	Sheep	Percent	Horses	Percent
Grand Total	Greasewood	27	Stable	10	Good	7 c/	Good	10 d/	Good	6 e/
	Shadscale	25								
	Black Sagebrush	15	Slight	62	Fair	39	Fair	48	Fair	34
	Big Sagebrush	8	Moderate	23	Poor	53	Poor	41	Poor	59
	Pinyon-Juniper	10								
	Horsebrush	5	Critical	4						
	Rabbitbrush	4								
	Four Wing	2	Unclassified	1		1		1		1
	Winterfat	1								
	Bunchgrass	1								
	Short Grass	<1								
	Sod Grass	<1								
	Mountain Mahogany	<1								
	Perennial Forb	<1								
	Annual Forb	<1								
	Barren	1								

NOTES: a/ Barren is lava, playa, <2% vegetation, or to steep or rocky
b/ Esmeralda County = unclassified
c/ Excludes 23,665 acres in Esmeralda County
d/ Excludes all of Esmeralda County -- Wagon Johnnie and Stone Cabin
e/ Excludes all of Esmeralda County -- Wagon Johnnie

PRELIMINARY
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RANGE CONDITION MAP FOR CATTLE

RANGE CONDITION MAP FOR SHEEP

PRELIMINARY DRAFT

RANGE CONDITION MAP FOR HORSES

Trend

Several fenced and unfenced four-acre study plots were established in Nevada in the late 1930's to obtain information on what was considered overgrazed range. The study was concerned with patterns and rates of vegetation changes that were occurring for areas under continued grazing and conversely with these areas excluded from livestock grazing.

These plots were surveyed and compared at the date of establishment (1941 and 1942) and again in 1946, 1959, 1960, and 1975. Over time eight of the original 28 study plots have been abandoned because of land ownership changes or other factors which limited the usefulness and reliability of data that could be obtained.

The 1975 readings and trend data compilation are presently under BLM contract for summarization. To date (December 1976) this report has not been published nor has it been made available for use in this environmental statement.

The Soil Conservation Service completed two extensive vegetation reproductive capability site surveys in Railroad Valley (1971) and Big Smoky Valley (1974). These site capabilities surveys can be used as a guide to trend, but not as a hard base data, especially for areas outside the survey areas. As one-time data, these surveys cannot be used as a basis for trend.

PRELIMINARY
DRAFT

Threatened or Endangered Species

Following the publication by the Smithsonian Institute of a list of threatened and endangered plants of the United States, the U.S. Fish and Wildlife Service released a notice of review in the Federal Register, July 1, 1975. The notice requested comment on over 3,000 plants (127 in Nevada).

The discussion presented here is based on endangered species listed in the June 16, 1976, Federal Register notice, and the threatened species listed in the July 1, 1975, Federal Register. The information was gathered from a literature survey, herbarium records, and data compiled by other agencies and groups, such as the U.S. Forest Service and members of the Northern Nevada Native Plant Society. There is no comprehensive survey covering the threatened or endangered plants of Nevada.

Following is a summary of the report prepared for the Tonopah study area. The full report is available by writing State Director (N-911), Bureau of Land Management, Room 3008 Federal Building, 300 Booth Street, Reno, Nevada 89509. Approximate locations of plants discussed here are shown on the Threatened and Endangered Plant Map. Alpine forms found at higher elevations on National Forest lands and other collection sites located outside the Tonopah study area have not been considered in this listing.

PRELIMINARY
DRAFT

PRELIMINARY DRAFT

THREATENED AND ENDANGERED PLANTS MAP

Endangered:

Asclepias eastwoodiana - Perennial, blooms May-June, found in clay hills, stiff soil derived from limestone, and some alkali areas. Located between Belmont and Manhattan at 6,900 feet in Nye County and northeast of Goldfield on the Esmeralda-Nye County lines. Associated with A. cryptoceras. (Barneby, "Species of Asclepias", 1945.)

Astragalas lentiginosus v. sesquimetralis - Perennial, blooms May-June, found on alkaline clay flats ± 4,000 feet (Barneby, Atlas of Astragalas, 1964). Collected from Soda Springs, Nevada--Mineral County, near Candelaria (Rydberg, North American Flora, 1929).

Astragalas serenoi v. sordescens - Perennial, blooms May-July, found on gentle slopes and flats with low sagebrush at 5,000-8,000 feet. Located 35 miles northeast of Warm Springs, Nye County (Barneby, Atlas of Astragalas, 1964), and seven miles south of Belmont at 6,800 feet, Nye County (Barneby, "Pugillus

Astragalorum," 1954). It is reported from southern valleys of the Central Great Basin section (Cronquist, et al., Intermountain Flora, Vol. I, 1972).

Astragalas uncialis - Perennial, blooms May-June, found in alkaline-adobe soil; dry knolls and gullies; limestone derived soils. Located in the vicinity of Currant in northeast Nye County at 5,300 feet; known only from the foothills of the White Pine and Pancake Ranges. Can be expected on limestones elsewhere in eastcentral Nevada. (Barneby, "Pugillus Astragalorum", 1942; Barneby, Atlas of Astragalas, 1964.)

Ivesia eremica - Perennial, found at Ash Meadows in southern Nye County, from an alkaline limestone marsh (Coville, "Plants, Southern California," 1892). Also located near Warm Spring, five miles north of Duckwater, near the road to Eureka, in alkali soil (Henning 796-UNR10745).

Lewisia maguirei - Perennial, blooms in June, found in loose, limestone-derived soil with pinyon, juniper, and artemisia. Located on the ridge above Cherry Creek Summit, Quinn Canyon Range, in northeast Nye County at 7,500 feet (Holmgren, "Lewisia," 1954).

PRELIMINARY
DRAFT

Machaeranthera leucanthemifolia - Annual or biennial, apparently widespread in Nevada (many herbarium specimens at University of California, Berkeley, and Rancho Santa Ana Botanic Garden). Species found on disturbed sites, burns, sandy sites, and associated with sagebrush/mountain mahogany, sagebrush/pinyon/juniper/yellow pine, shadscale, 4,600-8,500 feet (Nye County). It was collected in the study area at the south end of Hot Creek Valley, T.7N., R.52E., S.31, in the shadscale type (Bostick-UNR29591; UNLV4504).

Penstemon nyeensis - Perennial, blooms in July, endemic to the Monitor Range in rocky places on sagebrush and pinyon ridges (Crosswhite, "Nevadan Penstemon," 1965). Found on Table Mountain, 9,800 feet, by Maguire and Holmgren 25688. The type specimen is in the U.S. National Herbarium.

Trifolium andersonii ssp. beatleyae - Perennial, blooms May-June, found at Shoshone Mountain, Nevada Test Site (Type), Nye County; and at Clover Hill, near Manhattan (Toiyabe National Forest), Nye County. (Gillett, "Taxonomy of Trifolium," 1972.)

Threatened:

Abronia orbiculata - (Renamed A. turbinata, Brittonia Vol. 27, 1975.) An annual found on sandy soil and associated with

PRELIMINARY DRAFT

desert scrub in southeastern California through western Nevada to southeast Oregon, at 2,943-8,011 feet. Found in Clark, Washoe, and Nye Counties. Artemisia tridentata slope 49 miles northeast of Tonopah, two miles southwest of Warm Springs.

Arabis shockleyi - Perennial, found in widely scattered locations in Utah, Nevada, and California. Located at Miller Mountain, Mineral County, near the Esmeralda County line; and at the Nevada Test Site. Probably grows between sighted locations (Rollins, Monograph on Arabis, 1941).

Astragalas callithrix - Perennial, blooms May-June, known only from two valleys in northeast Nye County, separated by the Pancake Range (Barneby, Atlas of Astragalas, 1964). Found 15 miles north of Warm Springs Ranch on U.S. Highway 6 (Maguire and Holmgren 25139-RSA106452; UC738312), eight miles east of Warm Springs in deep valley dunes (Ripley and Barneby 4434-RSA106450), and seven miles south of Callaway in deep sands (Barneby and Ripley 3631-RSA106454).

Astragalas pseudiodanthus - Perennial, blooms May-June, associated with deep sands, dunes, and sandy flats. Located 20 miles southeast of Tonopah north of Cactus Peak at 5,500 feet. Often with Sarcobatus baileyi and Hilaria jamesii in Lodi Valley and vicinity of Tonopah. (Barneby, "Pugillus Astragalorum,"

1942; Barneby, Atlas of Astragalas, 1964.)

Astragalas toquimanus - Perennial, blooms April-July, found on gravelly slopes, in canyons, growing up through sagebrush in the pinyon belt between Manhattan and Belmont, at 7,000 feet. Probably occurs under similar conditions throughout the Toquima Range (Barneby, "Pugillus Astragalorum," 1942; Barneby, Atlas of Astragalas, 1964).

Castilleja linoides - Found in Elko, White Pine, Eureka, and Nye Counties at 8,000 feet and above. Found seven miles northwest of Toiyabe Dome at Stewart Creek (Hitchcock and Martin 5588-PC254020).

Coryphantha vivipara v. rosea - Perennial (cactus), blooms in June, originally described from the Charleston Mountains, Clark County (Clokey, "Charleston Cactaceae," 1943). Collected from Hunt's Canyon, Monitor Valley, in Nye County at 7,000 feet (Farwig and Gerand 719-PC318043).

Cryptantha hoffmannii - Biennial, blooms June-July, found in gravelly soil, associated with pinyon-juniper, in western Nevada to southeast California, at 7,000-9,000 feet (Brigham Young Science Bulletin, Vol. 13(4):33). Found five miles west of Warm Springs, in sandy loam at 6,200 feet in artemisia-pinyon-juniper

stand (Williams 631-UNLV406).

Draba crassifolia v. nevadensis - Biennial or perennial, found five and one-half miles north of Toiyabe Dome, Stewart Creek, at 7,000 feet (Hitchcock, "Drabas," 1941). A Lincoln County collection says, "not grazed; on heavily overgrazed dry ground among Artemisia tridentata, Grayia spinosa, ... 5,000 feet," (Sharsmith 4806-UCM226646).

Gilia nyensis - Annual, blooms May-June, found on Nevada Test Site northward to BLM land. Associated with Artemisia, pinyon-juniper, Atriplex; grows in loose sands and washes; loose tuffs, sands and gravel (herbarium labels). Found 12 miles south of Hot Creek, along Nevada Highway 25; 10 miles northeast of Warm Springs, by U.S. Highway 6; and north side of Kawich Valley playa, 13 miles south of Nevada Highway 25 (Reveal, "Eriogonum and Gilia," 19).

Lesquerella hitchcockii - Perennial, blooms June-July, found in Quinn Canyon Range in northeast Nye County at 7,000-8,000 feet. Located in loose gravelly soil, with pinyon-juniper near Cherry Creek Summit. Other collections from higher elevations. (Maguire and Holmgren, "Botany, Intermountain Region," 1951; Munz, "New Plants, Nevada," 1929; herbarium labels.)

PRELIMINARY
DRAFT

Penstemon arenarius - Found at Belleview, Mineral County, near the Esmeralda County line (Greene, Pittonia, 1889); also two miles west of San Antone and six miles east of the Tonopah-Cloverdale Road, Smoky Valley; with Tetradymia glabrata, Ephedra nevadensis, Sarcobatus baileyi (Holmgren and Maguire 10556-UCM285699).

Penstemon pudicus - Perennial, blooms in June, found on mountain slopes, washes, lower slopes at 7,586-8,992 feet, with Artemisia tridentata, Cercocarpus ledifolius, Pinus monophylla, and Juniperus osteosperma. Located in northwest Reveille Valley, 17 miles south of Warm Springs, Kawich Range (Reveal and Beatley, "Penstemon and Grindelia," 1971). According to Forest Service information, wild horses eat this plant.

Silene scaposa v. lobata - Perennial, blooms in July, described from Idaho (Type), Oregon, and Nevada (Hitchcock and Maguire, "Silene", 1947). Located at Mohawk, Toiyabe Mountains, Nye County, at 9,800 feet (Linsdale 325-UTC).

PRELIMINARY
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Wildlife

Terrestrial Habitat

A biotic community as defined by Odum (Ecology, 1959) can be, "any assemblage of populations living in a prescribed area or physical habitat." Common usage, however, usually depicts biotic communities according to major plant communities or habitat types.

In the Tonopah study area the numbers and distribution of wildlife populations are largely controlled by the altitudinal zonation of vegetal types. The larger animals, especially the predators and browsers, range throughout the major vegetal zones and from one zone to another. Smaller animals tend to be dependent and have their greatest abundance in or between well defined vegetal types. Deterioration of any one community or ecosystem exerts a severe limiting influence on wildlife populations causing physiological stress and concentration into areas of poor habitat - food, cover,and space. For the purpose of this statement the concept of habitat types will be used to help relate wildlife populations and their interactions as a component in the complex interrelated ecosystem represented in the Tonopah study area.

PRELIMINARY
DRAFT

National resource lands (NRL) of the Tonopah study area provide seven general types of habitat necessary for continued existence of terrestrial wildlife populations. Four are broad vegetative types which, when combined, encompass over 95 percent of the surface acreage of the study area.

These vegetative types include salt desert shrub, big sagebrush, low sagebrush, grassland, and pinyon-juniper woodland. The remaining three types--wetlands (marsh, riparian or streamside, and meadows), rocky cliffs and canyons, and coniferous forest--are limited in acreage. Each area is nevertheless of particular significance as wildlife habitat. The preceding section on vegetation gives detail as to the vegetative composition of each type, and includes a map (Chapter II, Vegetation) indicating distribution and a table (Table II-17, Vegetation Types) depicting the acreage of vegetative types within the study area. The salt desert shrub type provides habitat for magpies, mourning doves, jackrabbits, cottontails, and numerous small mammals, and shrub-nesting, non-game birds. The relatively high density of rabbits, small mammals, and birds also makes predators such as coyotes and wintering birds of prey common inhabitants of the salt desert shrub type.

PRELIMINARY
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Antelope rely on the valley vegetative types of low sage, grassland, and areas of salt desert shrub to provide yearlong habitat. The low shrub groups are utilized extensively during winter months when browse use is highest. A shift in use occurs in spring when new growth of forbs and grasses is sought. (Taylor, Foods of Pronghorn, 1973.) Antelope also utilize the interspersed areas of grassland habitat, often as summer and spring-fall range. Ground nesting birds, such as the horned lark and western meadowlark, are common, as are a variety of small mammals and reptiles. The low sage associations, when located in conjunction with other habitats required by sage grouse, are utilized as necessary winter habitat by these birds.

The pinyon-juniper and associated mountain shrub types are extemely important for browsing big game such as mule deer. These areas are often critical to winter concentrations of mule deer, providing much of the cover and forage during winter months. This association is also required by many shrub-nesting birds, cavity nesting birds (those that nest in hollow trees, for example) and woodland mammals, such as the porcupine, bobcat and mountain lion. This vegetative type provides habitat for numerous small and large mammals as represented by the badger, coyote, gray fox, rock squirrel, bushy woodrat, mountain cottontail, and other which rely on the pinyon-juniper type for food and cover.

PRELIMINARY
DRAFT

The animal most closely associated with pinyon-juniper and mountain shrubs is the pinyon mouse which requires pinyon-juniper trees in association with rocks and boulders in order to survive. (Hall, Mammals of Nevada, 1946.) A similiar situation exists for the cliff chipmunk, which in Nevada is found only in association with pinyon-juniper stands (Hall, Mammals of Nevada, 1946).

Some 60 species of Nevada birds are associated with the type discussed above. Common residents are the scrub jay, black billed magpie, and pinyon jay.

Wetland habitat is extremely limited in the study area (less than .1 percent), but provides crucial habitat for the largest variety of wild animals. The wetland type for the purpose of this report shall include wet meadows with associated aspen stands, riparian (streamside) woodland and brushland, and marsh areas. Presently, there are approximately 250 acres of marsh, 16 miles of permanent stream with adjacent riparian brushland, and 200 acres of meadows (mostly associated with small springs or seeps and riparian aspen or bush stands). Animals depending on this plant association include waterfowl, shorebirds, and wading birds in addition to a large variety of songbirds, small mammals, and furbearers.

PRELIMINARY
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PRELIMINARY DRAFT

The coniferous-forest type (other than pinyon) is restricted to several hundred acres at higher elevations on the Grant Range and at Morey Peak. This habitat type is significant habitat for mule deer, mountain lion, and the Grant Range bighorn sheep. Other common residents include chipmunks, northern pocket gopher, numerous birds such as blue grouse, Clark's nutcracker, and woodpeckers.

The final habitat, rocky cliffs and canyons, is found throughout the study area. Approximately 21,000 acres have been identified as steep and rocky areas. These areas are particularly important for birds of prey such as the golden eagle and prairie falcon which seek cliff areas for nesting habitat. Bighorn sheep are closely associated with this habitat type which affords protection and ready escape cover.

A detailed species list of the terrestrial animals found in the Tonopah study area appears in Appendix G. This listing represents both vertebrates and invertebrates known to exist in the area. Habitat preference, relative abundance, and seasonal occurrence for birds is indicated according to available information.

The bulk of available information relates to life history and habitat requirements of the game animals, especially the large herbivorous species such as deer, antelope, and bighorn sheep, and those species considered endangered. Little detailed information is available for the remaining game animals. Applicable data and known interactions will be summarized according to typical animal-habitat associations within each major habitat for the vertebrate species. Even this basic information

is commonly lacking for the invertebrates.

Large Mammals

Dietary Overlap: Four species of large mammals, (mule deer, pronghorn antelope, bighorn sheep, mountain lion) occurring within the study area are classified as big game. (See Table II-20, Big Game Population Status.)

PRELIMINARY
DRAFT

TABLE II-20

BIG GAME POPULATION STATUS

Statistics on occurrence of mule deer, pronghorn antelope, bighorn sheep, and mountain lion are illustrated.

Harvest statistics for big game are included in the Recreation section of this chapter. The large grazing mammals (mule deer, pronghorn antelope, bighorn sheep) each exhibit specific grazing preferences, and normally utilize certain plants only lightly or seldom used by other species. This individuality of forage use is reinforced to some extent by some plants being more palatable, abundant, or nutritious at different seasons. However, seasonal competition for forage can and does exist between species. Competition is intensified by poor range conditions which results in selection of alternate or less preferred forage because of limited availability or absence of customary forage.

In the winter-spring period, deer are feeding largely on mountain mahogany, bitterbrush, and other browse. Deer prefer early developing grasses and forbs which constitute an increasing part of the diet until late summer when they must return to browse plants. While antelope feed on sagebrush and saltbrush during winter months, they begin feeding mostly on grasses and forbs in the spring. Competition between deer and bighorn sheep is greatest in early spring when both species seek out the new growth.

The various grazing animals tend to separate themselves somewhat naturally in both summer and winter ranges, but seasonal forage preference and availability commonly results in considerable overlap at certain seasons. Antelope share their valley floor habitats with livestock in southern areas and domestic sheep in the northern Sand Valley area. Deer, bighorn sheep, and wild horses frequently share at least a portion of their habitat area, with attendant competition for specific forages.

A forage allocation for reasonable numbers of big game as determined through the management framework plan (MFP) and required by the Taylor Grazing Act of 1934 is reflective of the major reductions big game populations have undergone from the 1940's until present. This reservation will provide the required forage for a big game population equal to approximately one-half previously known peak numbers. The provision of adequate habitat, capable of providing needed requirements for reasonable numbers, is required legally and biologically to insure viable populations. Expanded herd numbers are mandatory to insure a population resiliency capable of sustaining herd bases resulting from extreme winter conditions, etc., without elimination of a population. The allocation of forage for expanded populations is in recognition of the critical dependence of big game on habitats within the study area, such as the Morey Bench winter range, and bighorn sheep use areas of Lone Mountain. (See Primary Use Area Map which includes information on mule deer, bighorn sheep and pronghorn antelope.)

PRELIMINARY
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PRIMARY USE AREAS OF

MULE DEER, BIGHORN SHEEP AND PRONGHORN ANTELOPE

MAP

Mule Deer: As in most Great Basin states, deer herds of the study area have fluctuated considerably within the past 30 years. Deer were uncommon in the study area until the mid-1920's. (McColm, Wildlife Investigations, 1963). Deer numbers reached a peak in the late 1940's and early 1950's, but declined drastically in the mid-1950's. They again reached high numbers in 1959-1961. Numbers declined until 1965 when harvest data indicates an increasing trend which has continued until the present primarily as a result of relatively high production and little over winter loss in the last few years. The fall doe-fawn ratio of the Tonopah study area does not differ materially from the statewide ratio of 59:100 with 64.7:100 in management area 16, 70.4:100 in management area 12, and 68:100 in management area 22. Data for production in unit 25 was insufficient to estimate numbers; however, it was assumed that fair production exists as evidenced by the observance of twin fawns by Nevada Department of Fish and Game (NDFG) personnel, and the relatively high buck-doe ratios. (Nevada Department of Fish and Game (NDFG) Big Game Investigations, 1976.) The populations of these areas are thought to be increasing slightly (NDFG, Big Game Investigations, 1976.)

As discussed below, fluctuations in part are attributed to over-utilization and subsequent declines in forage production on ranges subjected to increased numbers of livestock and big game.

Predation losses are usually small in comparison to other direct mortality factors in healthy deer populations that are near the range carrying capacity. Coyotes and mountain lions are assumed to contribute to herd losses,

although no accurate data is available.

PRELIMINARY DRAFT

Winter weather over study area deer ranges exerts a severe limiting influence on deer populations. Physiological stress and concentration into areas of usually poorer habitat (food, cover, and space) make winter ranges critical habitat. However, the condition of deer entering winter ranges has a direct influence on winter survival. Davenport (Results of Deer Feeding, 1939) noted that deer entering winter in good condition can stand a weight loss of 30 percent during the winter. Thus, spring, summer, and fall range may also be critical habitat. Which habitat is exerting the most influence is indicated by deer condition. High fawn mortality and low conception rates is indicative of poor summer range while general starvation on winter ranges is indicative of poor winter range (Delmas, Mule Deer Feeds, 1971.)

Limited habitat inventory data shows deer habitat in the Tonopah study area to be in a generally fair condition. There is a trend toward improvement in areas such as Morey Bench. There is a static to downward trend for deer habitat of the Kawich range which continues to be subjected to overuse by wild horses, livestock, and big game. (NDFG, Wildlife Estimates, 1976.) Limited observation and review of available studies indicate generally adequate winter range, excepting severe winters. Past overuse and subsequent deterioration of summer ranges, noted as early as 1930 and continuing until the mid 1950's, is assumed to be a major factor in past deer decline and present numbers. The past overuse of critical summer ranges was especially evident on use areas adjacent to the headwaters of Reese River, Twin Rivers, Clover Creek, and Peavine Creek, located in the Toiyabe Range. (USFS, Wildlife Management Plan, 1972.)

The overall decline of mule deer by as much as 95 percent in some areas has resulted in only a fraction of the previous numbers currently occupying the study area. Mule deer herds have suffered major reductions from peak populations of the 1940's to all time lows of the 1960's.

Pellet group surveys and aerial survey data gathered by NDFG personnel in the Toiyabe Range (Management Area 17) indicates that deer numbers declined by 90-95 percent between 1960 and 1966. Data for the Hot Creek Range (Management Area 16) indicates a downward trend since 1958, with a 78 percent reduction between 1958 and 1966. (McColm, Wildlife Investigations, 1967.)

Historic NDFG departmental records indicate deer of the study area are highly migratory (based on trapping efforts during the early 1960's in the Hot Creek Range). Marked deer observations and tag returns indicated movements to summer ranges in North Antelope, North Monitor, Toquima, and North Toiyabe Mountain Ranges of Nye County, with some observations in the Lander and Eureka County portions of these ranges. (See Game Management Units Map.)

PRELIMINARY
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PRELIMINARY DRAFT

GAME MANAGEMENT UNITS MAP

Early-day ranchers reported migrations between various mountain ranges within NDFG management Area 16, with a significant "drift" noted annually from the Hot Creek Range near Morey Bench, east through the Pancake Range to the South Grant Range. (See Known Migration Routes Map.) All trapping information and historic citizenry records indicate considerable migration to and from this management area.

KNOWN HISTORIC MIGRATION ROUTES MAP

PRELIMINARY
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While early data did not indicate percentages as to resident and migratory populations, it is assumed by NDFG personnel that a high percentage of the mule deer populations inhabiting management units 16 and 17 are non-migratory, about 45 percent and 70 percent, respectively. (See previously mentioned Game Management Units Map.) These assumptions are based on limited data and are subject to revision in light of ongoing investigations. (NDFG, Wildlife Estimates, 1976.)

The resident mule deer populations of NDFG Management Units 16, 17, and 22 are believed to range within a one-mile radius in suitable habitat, with seasonal movements up or down mountain ranges to avoid snow depth or to take advantage of forage availability. Migration to and from seasonal ranges reflects more change in altitudes than in long-distance movements.

Current use data indicates four crucial ranges within the study area. These include three summer ranges: Toquima Range (Area 16, Mt. Jefferson), Arc Dome (Area 17, Toiyabe Range), and the Kawich Range (Area 25). (See Primary Use Area Map.) Only the latter is located within national resource land. The fourth area identified as a crucial winter range encompasses Morey Bench, which is located on the east slopes of the Hot Creek Range. It is administered by the Bureau of Land Management (BLM).

PRELIMINARY DRAFT

PRELIMINARY
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The Kawich crucial area, located on the southern end of the Kawich mountains, is of particular significance for mule deer because of the availability of water and succulent forage. The area is assumed to be similiar to other summer ranges of the study area with regard to past over-utilization of forage by larger numbers of mule deer than are now present, and heavy livestock utilization. The summer ranges have continued to be subjected to heavy use by wild horses even though in recent years mule deer use has been light to moderate because of relatively low numbers. The subsequent use by an estimated 200 wild horses on historic deer range has largely compensated for reductions of historic mule deer and livestock use.

Mule deer use in recent years has been light to moderate at Kawich with an estimated five to twelve deer days use per acre. In the past this area supported high concentrations of big game and livestock. Range observations indicate browse condition is generally satisfactory, with some areas of browse over-utilization and subsequent hedging. The primary habitat deficiency is on overall lack of early green-up grasses and forbs.

The estimated deer population of that portion of game management unit 25 in the Tonopah study area is 400, with approximately 330 utilizing NRL of the Kawich and Reveille ranges within the unit. The estimated reasonable numbers for mule deer utilizing NRL within the management unit is 660. (NDFG, Wildlife Population Estimates, 1976.)

PRELIMINARY DRAFT

PRELIMINARY DRAFT

The second crucial mule deer area on NRL is the Morey Bench area. This range has long been a winter concentration area for mule deer which converge on the bench from various summer ranges (NDFG, Wildlife Estimates, 1976; Berg, Evaluation Deer Ranges, 1966). Deer migrate from several summer ranges of central Nevada which include Antelope Range, Roberts Mountains, Simpson Park Range, and Toiyabe Range (Maier, Plan for Morey Bench, 1967; Tueller and Monroe, Management Guidelines, 1975). Migrations may start in early September with the majority of deer occupying the winter range at Morey Bench until late October.

The spring migration to summer ranges starts in April. Most deer move off the Morey Bench area by the last of May (McColm, Wildlife Investigations, 1967). The heaviest utilized area of Morey Bench is restricted to approximately 2,500 acres where the predominate browse includes big sagebrush, desert bitterbrush, and Anderson peachbrush. Although this vegetative community is most utilized, nearly all plant associations of the area supporting bitterbrush were heavily used (Tueller, Monroe, Management Guidelines, 1975). Prior to 1968, Deer Days Use (DDA) per acre of the major browse in this area, combined with livestock use, averaged 179. Thus, most browse species have been over-utilized and are in poor condition. Bitterbrush has particularly been overused with numerous plants killed and others so weakened that little forage is produced. Studies by Berg (Selected Deer Ranges, 1966) indicated that over-utilization of bitterbrush resulted in more than a 50 percent decline in plants. While deer use has remained high (182 DDA use on the primary forage types of big sage, desert bitterbrush, and desert peachbrush), a gradual upward trend is indicated by an increase in forage diversity and bitterbrush reproduction.

These increases are attributed to the discontinuance of livestock grazing since 1968. An increase in nearly nonexistent grasses and forbs coupled with a limited increase in browse production, indicates a favorable mule deer habitat trend not evident in 1964 (Tueller, Monroe, Management of Deer Habitat, 1975.) This same area was in a generally poor condition in 1972.

The total estimated deer population of game management unit 16 is 4,010 with an approximate population of 1,800 using NRL. (NDFG, Wildlife Estimates, 1976.) Such habitat variables as winter severity, forage availability, and snow depth determine winter deer populations of Morey Bench. Estimates range from 600 to 1,300 deer which utilize the 2,500 acre critical area (McColm, NDFG Report, 1967.) The reasonable numbers for mule deer in this management unit utilizing NRL within the study area are 9,800 animals (NDFG, Wildlife Estimates, 1976.)

PRELIMINARY
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PRELIMINARY
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PRELIMINARY DRAFT

There are several other winter and summer ranges at Hot Creek not considered crucial at present population levels. The heaviest deer winter concentrations in game management unit 16 are found within the Hot Creek Range. There are an estimated 403 square miles of deer range, including summer range in this group of mountains. Summer ranges are restricted to elevations above 8,000 feet and are largely confined to that portion of the range north of Hot Creek Canyon. Total summer range probably does not exceed 135 square miles. (McColm, Wildlife Investigations, 1967.) The highest of these ranges, those in Morey Mountain area, indicate a severe overuse by deer in the past, but now are in fair to good condition. (McColm, Wildlife Investigations, 1967.) Surveys conducted by the NDFG indicate a relatively small number of deer "summer" in this range. Estimates taken by NDFG personnel from 1957 range surveys indicated a maximum deer density per square mile of about five. Using this figure the total deer population for the estimated 135 square miles of summer range would be 600 to 700 animals. This was considered a maximum figure in NDFG Reports of 1967 (McColm, Wildlife Investigations, 1967) and is probably even less today as a result of continuing overall declines from 1957 to the present.

Water is not abundant in the Hot Creek range and south of Hot Creek Canyon. In the Squaw Wells area it is scarce. North of Hot Creek, water is more abundant. There are intermittent flows in some of the major drainages and a number of springs throughout the area, however, water could limit the number of deer that summer in this range.

(McColm, Wildlife Investigations, 1967.)

PRELIMINARY DRAFT

Four important deer winter areas within the Hot Creek Range include:

East Side of Morey Mountain -- This takes in the area between the old town of Morey and South Six Mile Canyon; it includes Morey Bench. This the most important of the four areas. Deer concentrations are found between the 6,000 and 7,000 foot elevations to encompass about 37 square miles. The major browse species is desert bitterbrush (Purshia glandulosa) (Berg, Selected Deer Ranges, 1966), although mountain mahogany and some cliffrose are also found in the area. Deer generally use the area from late October through May. Quantitative data as to deer use for areas surrounding Morey Bench is lacking. However, in comparison with similar areas, it is assumed that a range of 10 to 50 deer per square mile would represent maximum-minimum numbers. (McColm, Wildlife Investigations, 1967.)

Squaw Wells -- This area lies northeast of Moores Station. Deer concentrations are found between the 6,000 and 7,000 foot elevations to encompass about 15 square miles. The major browse species is desert bitterbrush, although some mountain mahogany is also found here. In the past the area was heavily used by larger deer herds - especially during early winter. During the past two years, however, the area has received only light use.

Past data for Squaw Wells indicates wintering population ranging from 10 to 50 deer per square mile depending on winter intensity, snow depth,

PRELIMINARY DRAFT

forage conditions, or summer ranges, etc. Population for the area during winter months is estimated at 200 - 1,000 animals. (McColm, Wildlife Investigations, 1967.)

Tybo-Keystone Area - This is the largest deer concentration area. It includes about 75 square miles of Hot Creek Canyon between the 7,000 and 8,500 foot elevations. Desert bitterbrush, mountain mahogany, and cliffrose are all found in relative abundance on favorable sites. While large numbers of animals have used this area in the past, deer have never concentrated to the extent they are in other portions of the range. As a result, key browse plants generally have not shown abuse characteristics typical of the previously identified deer ranges. This area seems to be used most heavily during the early winter.

Deer densities in the Tybo-Keystone area are assumed to fluctuate between five to twenty-five deer per square mile for an over all wintering population of 200 to 1,800 animals. (McColm, Wildlife Investigations, 1967.)

West Side -- This area is located in Little Fish Lake Valley along the foothills south of Big Cow Canyon and east of the Old Fish Lake Ranch to encompass an estimated 20 square miles. Deer concentrations are between the 7,000 and 8,000 foot elevations. Bitterbrush is found in relative abundance on favorable sites, and mountain mahogany is abundant at higher elevations. This area receives heaviest use in early winter.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Deer winter densities for the Tybo-Keystone area as determined through pellet counts on adjacent areas, are assumed to fluctuate between 10 to 50 animals per square mile population ranges from 300 to 1,000.

The South Pancake Range, and a northern portion of the Grant Range, also provide winter range for mule deer. These areas are in NDFG management unit 22, and support a total estimated 7,200 mule deer with approximately 900 utilizing NRL. Use of habitat on NRL varies seasonally depending upon forage and weather conditions, but general use includes winter utilization of the lower foothills. Summer range use is restricted to higher elevations in the Humboldt National Forest. While some browse stands and overall species diversity are less than satisfactory, it believed that summer ranges constitute present limiting factors. The succulent forage and water provided by typical summer deer range is thought to be lacking or of low abundance. The winter range common to the foothills and benchlands of the noted mountain ranges is not considered crucial with existing deer population and use periods. The estimated reasonable numbers for mule deer utilizing NRL of the study unit with game management unit 22 are 2,900 animals. This number would represent only 50 percent of the deer use made by expanded populations of past years. (NDFG, Wildlife Estimates, 1976.)

The benchlands and foothills adjoining national forest boundaries of the Paradise and Toiyabe Mountain ranges, in addition to the San Antonio Mountain, constitute the NRL winter range for that portion of game management unit 17 located within the Tonopah study area. (See Primary Use Area Map.) Only a small percentage of the total winter range of the Toiyabe and Paradise range

PRELIMINARY DRAFT

extends across national forest boundaries onto NRL. In normal winters, these areas could be expected to support an estimated 125 head. The reasonable number of mule deer that could be utilizing NRL of the study area within game management unit 17 is estimated at 830 animals. This number would represent a population of approximately 50 percent of the numbers of peak populations.

The San Antonio Mountains provide limited winter range for an estimated 20 deer.

The winter ranges noted are not considered crucial at present population use levels, and are not known to represent limiting factors for deer herds of game management unit 17.

The northern section of game management unit 17 encompassing the Monte Cristo Range lies within the study. Limited inventories indicate a yearlong mule deer population inhabiting marginal habitat within this range. Total population is estimated at 25 to 50 head. Seasonal use areas result from altitudinal shifts from mountain ridges to foothills. Limited inventory suggests that winter areas are more than adequate to support existing numbers. Summer range is considered generally inadequate as a result of nearly nonexistent succulent forage and water. This condition is assumed to constitute the primary limiting factor for mule deer increases within this range. The general lack of quality summer range is reflected through dietary studies which indicate a high yearlong dependence on browse species (Cole, Diebert, Tueller, Big Game Range, 1967.) Habitat within the Monte Cristo Range is considered marginal because of a lack of high quality forage such as cliffrose, bitterbrush, and perennial grasses which only occur in trace amounts. The heavy use of sagebrush by mule deer would seem as much a result of availability, as of preference.

PRELIMINARY DRAFT

Pronghorn Antelope:

An estimated antelope population of 285 animals consisting of many small bands utilize habitats within the Ralston, Monitor, Stone Cabin, Reveille, and Railroad Valley allotments. (See Primary Use Area Map.) Observations by NDFG personnel also indicates considerable usage of pinyon-juniper woodlands, rolling foothills, and mountain brush ecotones (plant associations); therefore, many antelope-use areas would probably include considerable overlap of antelope-deer winter and yearlong ranges. It is assumed (based on earlier reports) that antelope were more plentiful in historic times, but have been reduced in numbers through exclusion from choice ranges to less desirable desert ranges as a result of colonization, exploitation, and competition from domestic livestock. The downward trend from historic times has continued, with periodic exceptions, until recently. A downward trend in population was noted in 1966 and 1967, with numbers apparently stable since 1968. (NDFG, Nevada Big Game Report, 1967-70.) Existing populations are assumed to represent only a fraction of numbers once occupying the study area. The reasonable number of antelope utilizing habitat on NRL within the study area would be approximately 900 animals.

Known use areas include the pinyon-juniper foothills during summer months, with use shifting to valley bottoms in winter months. Additional migration may occur, but the extent is unknown. Use patterns for much of the area are related to water availability, which is limited in quantity and distribution. Investigations by BLM and NDFG personnel indicate known summer and winter areas lack adequate water facilities to support antelope use of available range. The majority of existing utilized range is in generally deteriorated condition for antelope, since they lack forbs, meadows, and water. (BLM,

PRELIMINARY DRAFT

Tonopah Unit Resource Analysis, 1975.)

The poorest antelope habitat occurs in areas of wild horse concentrations and domestic livestock use, including habitats within Ralston, Reveille, and Stone Cabin Valley. It is in these areas that competition among wild horses, cattle, and antelope for limited water and forage is most apparent. Antelope feed primarily on forbs and browse, with the volume of browse in their diet increasing in winter as forbs become less palatable (Hoover, et al., Antelope of Colorado, 1959). Food habit studies conducted in Nevada indicate that shrubs are an abundant type of forage in antelope diets yearlong. Forbs are also important, but grasses are relatively insignificant. (Tsukamoto, Deibert, Antelope Food Habits, 1969.) Black sagebrush, bitterbrush, fourwing saltbrush, spurge, and penstemon are considered the most important forages for antelope of the study area.

Information from the Red Desert study by the University of Wyoming (1968) indicates a yearlong average of the following type of forage consumed by antelope:

Browse	Forbs	Grass
59.3%	32.0%	8.7%

The consumption of forbs was also highest during the spring and summer seasons, and they comprised the bulk of the diet for that period. Browse species consumed were heaviest and most dominant during the fall and winter periods. However, as pointed out above, on a yearlong basis, browse comprises over one-half of the antelope's diet.

PRELIMINARY DRAFT

While competition between antelope and cattle would be negligible on good range because of a livestock preference for grass, competition can become significant on deteriorated ranges. A livestock preference for bitterbrush (Gullian, Wildlife Use of Plants, 1964) and other browse species can result in significant diet overlap and resultant competition. Direct competition for forage can result from overlap of pronghorn antelope and domestic sheep use, especially when the range is in poor condition.

No defined kidding grounds or crucial areas have been identified for the small bands occupying the study area. Existing fences within the unit do not appear to restrict antelope movements; this may result, in part, from a lack of fencing in the area. Also, fence construction meets cattle requirements, instead of sheep requirements.

Bighorn Sheep: Bighorn sheep are known to occupy portions of four mountain ranges encompassed by the study area. They are: east slope Toiyabe Range, Grant Range, Monte Cristo Range, and Lone Mountain. Of these areas only the Monte Cristo Range and Lone Mountain represent major bighorn use areas on NRL. The majority of bighorn habitat within the Toiyabe and Grant Range lies within the Toiyabe and Humboldt National Forests. However, an area of the Grant's range extending from Irwin Canyon on the south to Box Canyon on the north provides yearlong habitat for an estimated 10 bighorn sheep (NDFG, Population Estimates, 1976). The remaining areas, Lone Mountain and the Monte Cristo range, provide habitat for an estimated 40 bighorn sheep. The Lone Mountain herd is considered one of two or three healthy, productive herds, with one of the highest sheep population densities in the State of Nevada (NDFG, Review URA, 1975). A review of 49 autopsy reports of bighorn sheep which died in southern Nevada, indicates a wide range of disease conditions.

Among these, pneumonia is listed as a cause of 80 percent of the deaths, and may have been secondary to other problems in some cases (Walstrom, Water for Nevada, 1973). While little is known of the actual limiting factors affecting bighorn herds, it is felt domestic sheep disease may still prevail from early association with the bighorns. Lungworm may also be prevalent. (Allen, Parasites, 1964; Taylor, Sheep Mortality, 1975.)

Lungworms (Protostrongylus stilesi) are transmitted from sheep to alternate hosts (tiny land snails) by defecation, and the cycle is completed when sheep ingest infected snails (Hibler, Epidemiology Lungworm, 1972).

Lungworm larvae are also transmitted through the placenta from ewe to lamb, especially when infected sheep are in a concentrated area. This transmission causes a high incidence of lamb mortality. Any factor which tends to bring sheep together (such as limited water sources) increases the possibility of mortality caused by the lungworm-preumonia complex (Hibler, Epidemiology Lungworm, 1972).

Bighorn sheep populations in the Toiyabe and Grant Ranges are believed to be down 80 percent from numbers found in the 1950's (NDFG, Wildlife Population, Estimates, 1976). While data for bighorn sheep populations and use areas is limited for most of the study area, recent helicopter surveys indicate a viable population of relatively high density utilizing Lone Mountain. (See the Primary Use Map.) Aerial surveys indicated a ratio of 62 rams to 100 ewe to 33 lambs. Indications are of excellent production over the last three to five

years, coupled with good ram survival. (Lusk, NDFG, Big Game Investigation, 1976.)

The estimated reasonable numbers for bighorn sheep on NRL of the study area, which if attained would represent approximately 50 percent of former population levels, would be approximately 600 animals.

Generally, sheep winter at low elevations, just below or in the pinyon-juniper areas, and summer at high elevations where escape cover, forage, and water exist. Sheep movements in the Toiyabe, Grant's, Monte Cristo, and Lone Mountain herd areas are thought to be controlled by the altitudinal zonation of vegetative types. There may be herd movement from national forest areas onto the Grant's, Worthington, and Golden Gate Ranges, located outside the study area.

Food habit studies from other bighorn study areas which are assumed to be comparable indicate grasses and sedges make up the bulk of yearly diet, followed closely by shrubs and forbs (Todd, Foods, Bighorns, 1975). In addition, Todd on page 110, concludes that food plant selectivity is closely related to plant succulence.

The primary grasses available to bighorn sheep of the Monte Cristo and Lone Mountain ranges includes Galleta grass, Indian ricegrass, needle grass, bluegrass, and alkali sacaton. Grass is generally sufficient in areas presently utilized by bighorn sheep. (Grasses average between five to ten percent of the ground cover.) (BLM, Esmeralda Unit Resource Analysis (URA), 1976.)

Forbs, important early spring feed for bighorn, are relatively scarce within known bighorn use areas (Monte Cristo and Lone Mountain), making up less than five percent of the ground cover. The most commonly used forbs include milkvetch, spurge, prickly pear, and yucca.

Primary browse plants utilized by bighorn sheep in these areas include big sagebrush, fourwing saltbrush, mountain mahogany, cliffrose, Mormon tea, and bitterbrush. The preferred browse species are generally abundant above 6,500 feet elevation (BLM, Esmeralda URA, 1976).

Of the three elements -- food, water, and cover -- required by bighorn sheep, water reflects the area's most critical habitat factor. While water sources are sufficient for bighorn of Lone Mountain (NDFG, Wildlife Estimates, 1976), the attraction of livestock, wild horses, and mule deer to these areas and resultant competition for water space and forage, continues to affect populations.

Bighorn sheep use areas of the Toiyabe and Grant Ranges represents less than satisfactory habitat conditions as a result of past overuse, lack of forb production, and reduction of available grassland through pinyon-juniper encroachment into previously established grassland and meadow sites.

There is no single reason available regarding the loss of bighorn sheep in Nevada. However, several wildlife biologists have cited a combination of logical reasons for their decline and disappearance. The most accepted reasons are from Jones, (Survey Sierra Bighorn, 1950) and Buechnew, (Bighorn Sheep, 1960), who both attribute the great decline in bighorn sheep to the increased human use of the land.

PRELIMINARY DRAFT

Mountain Lion: Mountain lion populations are presently considered low, but stable, in the Tonopah study area. General populations were assumed to be declining until recent years as a result of unrestricted harvest and relative intolerance for people. Lions were classified as predators in Nevada until 1965, when they were reclassified as big game animals with attendant seasons and present regulation of harvest.

Mountain lions are distributed throughout the remote mountainous portions of the study area, but areas of highest density are associated with areas of prey (primarily mule deer) concentration.

The largest number of lions are thought to inhabit the more remote areas of the Grant, Toquima, Toiyabe, and Hot Creek Ranges. Since harvest is now controlled, the availability of prey and the lack of human disturbance are the primary factors affecting lion populations.

The problems and conflicts affecting mule deer, and to some extent bighorn sheep, are indirectly related to problems of mountain lions.

The NDFG has expressed concern about the mountain lion populations as related to deer and bighorn populations in Quinn Canyon and Grant Range. There is a possibility that mountain lions may be acting through prey selection as a limiting factor on populations of bighorn sheep and mule deer.

Small Game

PRELIMINARY DRAFT

The desert cottontail, mountain cottontail, and pygmy rabbit constitute the only small game animals found within the study area. These species occupy broad areas encompassing the majority of habitats within the study. The ability to utilize a wide variety of plants results in cottontails of one specie or another found in nearly all vegetative associations.

Cottontails eat a variety of plants. Seton (Game Animals, 1937, p. 7) stated, "to make a complete list of the plants that serve the cottontails as food would mean a catalogue of the flora of the United States . . . nearly every kind of green grass, succulent herb or flowering plant is acceptable".

Available cover and degree of darkness appears to influence the location and the choice of food type of cottontails. Todd (Winter Food, 1927) noted that protection from enemies is as important as finding food, and Haugen (Life History, Cottontail, 1942) stated that cottontails would forsake an abundant food supply if the two were not found together. Lord and Casteel (Food Importance, 1960) concluded that lack of food was not an important cause of winter mortality. Dusi (Determination, Food Habits, 1952) noted that because of the great variety of plants utilized, food would not be the primary management consideration.

The suggested modification of grassland sites in favor of brushland species may expand cottontail populations through provision of additional food

PRELIMINARY DRAFT

supply and increased cover. However, this is only an assumption, since population increase is unknown. There does appear to be a direct relationship between cover and cottontail use, in which case the reduced ground cover and overall cover reduction associated with present over-grazing would be deleterious to cottontail habitat. This situation would especially be true of canyon bottoms or meadow areas which would be favored rabbit habitats because of plant diversity and succulence.

Furbearers

Eight species of furbearing mammals are known to inhabit the study area. Because they are primarily carnivorous, the population of furbearers in the area is closely related to the abundance of small rodents and insects.

The principal, non-game predatory mammals of the study area are coyotes and bobcats. Both species are widely distributed.

Coyotes are found in nearly all vegetative types and in all but the most barren terrain. While there are no population estimates for coyotes in the area, data collected by U.S. Fish and Wildlife Service (USFWS) personnel indicate a trend of relative abundance. Data from census studies in Ralston Valley located in the south central section of the study area, indicates coyote populations down in 1972; relative abundance up in 1973; and at a moderate level in 1974 and 1975. Coyotes have received particular attention in the Pancake Range where bands of domestic sheep are wintered.

PRELIMINARY DRAFT

While population fluctuations would normally relate to rodent population increases or decreases, increases in recent years may reflect curtailment of toxicants on NRL.

Bobcats, also widely distributed throughout the area, prefer steep and rocky terrain and brushy vegetation. Because of their shy disposition, bobcats are rarely seen in the area, although populations, especially in the mountains, are substantial.

Information for the remaining species is limited to relative abundance determinations and generalized ranges within the study area.

NonGame Small Mammals

The Tonopah study area supports a considerable diversity of small mammals which provides a food base for most of the area's carnivores. Thirty-seven species are found on the area: 25 rodent; two hare, two shrew and eight bat species. These species are summarized in Table II-21, Small Mammals of the Area. Studies conducted in similar habitats (USDI, Livestock Impact, Small Mammals, 1975), suggest that the greatest diversity of small mammals is found within the saltbush-greasewood, and pinyon-juniper grass communities, while short grass sites have the lowest diversity. Highest total populations can be expected in the saltbush-greasewood communities. Lowest total populations are found on grasslands.

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TABLE II-21

NONGAME SMALL MAMMALS SPECIES

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TABLE II-21

SEMIANNUAL SMALL MAMMAL DENSITIES

Three species of cottontail rabbit and two species of jackrabbit are found within the study area. Studies of comparable areas (USDI, Livestock Impact, Small Mammals, 1975) indicate the heaviest use by these species occurs within the pinyon-juniper-sagebrush communities. The areas of lowest concentrations occur on grasslands. Differences between the species habitat requirements, however, also influence their distribution. For example, jackrabbits are more likely to be found on grasslands, while cottontails prefer more brushy cover (Burt, Grossenheider, Field Guide to Mammals, 1964).

The bats of the area are primarily insect feeders, and are usually most active at night. The abundance of these species in the grazing area is unknown.

Birds

Upland Game:

Sage grouse -- Sage grouse found in the study area are widely distributed. Approximately 46 percent of the habitat within the study area boundary is occupied habitat and approximately 50 percent of this is national resource land (NRL). (See map on Wildlife-Sage Grouse Distribution.)

PRELIMINARY DRAFT

WILDLIFE - SAGE GROUSE DISTRIBUTION

MAP

Based on NDFG records a total of 68 strutting ground and 105 brood areas have been identified. Approximately 45 strutting grounds and 32 brooding areas are known to occur on NRL within the study area. A listing of legal descriptions of known strutting grounds appears in Appendix G (NDGF, Wildlife Population Estimates, 1976). A complete listing of known areas is not possible because of the vastness of the area, and the distinct possibility of unknown use areas. In addition, key wintering areas are unknown.

Sage grouse have evolved specific habitat requirements keyed to the ready availability of big sagebrush in close proximity to open strutting areas and mountain meadows used for brood rearing. The diminishment of any aspect of these requirements in turn reduces habitat quality and sage grouse population. Their dependence upon sagebrush is reflected by typical winter diets consisting of over 90 percent sagebrush leaves and seeds. A like dependence occurs for upland meadows which provides succulent green growth and abundant insects--the sole food source for sage grouse chicks during the first eight to ten days after they hatch.

To this complex interaction between native wildlife species and its habitat, have been added domestic livestock which, through forage preference and habits, have altered meadows and streamside habitats.

This habitat deterioration beginning in historic time and continuing at present has been the primary factor in reduction of once abundant sage grouse numbers.

While overall populations for sage grouse are difficult to determine, it is estimated there are approximately 4,500 sage grouse on study area lands. This figure is calculated from harvest data and questionnaire returns collected by NDFG personnel. Because of the potential for error that figure is considered conservative.

All known strutting grounds are considered as critical use areas for sage grouse, since in addition to their habitual use for strutting, sage grouse also rely on adjacent areas usually within a two-mile radius for 80+ percent of all nesting.

PRELIMINARY
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Chukars--Chukar partridge, first introduced in Nevada in 1929, have expanded to occupy nearly all high benches and mountain ranges with available water.

PRELIMINARY DRAFT

Chukar populations in the study area are typical in that there exists the potential for wide annual and long-term population fluctuations, as a result of habitat variables such as weather, precipitation, or intra-specific factors such as disease. Using a density estimate of seven birds per square mile for low,and 22 birds per square mile for medium, a total population of 16,000 birds is estimated for NRL of the study area. However, depending upon the breeding population carryover and productivity rate over a year or period of two to three years, total population could increase or decrease significantly. There are approximately 3,800 square miles of chukar habitat within the study area of which approximately 68 acres are NRL. The majority of this habitat is assumed to support medium to low density populations.

Winter starvation due to heavy snows covering food is considered an important limiting factor in the population (Edminster, American Game Birds, 1954.) South facing and other wind-blown slopes provide critical winter areas. In summer, distribution of water is another important limiting factor for chukar population.

Chukar are usually found within one mile of a water source during this period. The critical dependence upon water is reflected in the successful introduction

of chukar into the Black Mountain area of the San Antonio mountains. The only habitat modification there was addition of water through construction of a guzzler. There are broad areas within the study that are assumed to be capable of supporting introductions, or greater chukar densities, if there was increased water availability. Locations where known populations exist include the following mountain ranges: Paradise, Monte Cristo, Monitor, Toquima, Hot Creek, Kawich, Pancake, Brant, and San Antonio.

Mourning doves - Mourning doves are normally abundant in the grazing area during late summer and early fall. Although the species may be found on nearly all habitat types, highest population concentrations and most frequent use is near ponds, wells, and other water sources, and near irrigated land, such as occurs in Monitor, Big Smoky, and Stone Cabin Valleys.

Doves are prolific breeders and are highly adaptable in their nesting requirements. Big sage, willows, and other streamside vegetation, although limited, provide good nesting cover. In areas where suitable trees or bushes are absent, dove will nest on the ground. Of all game birds, the mourning dove is least affected by drought, devastation of ground cover by livestock, and other land uses. (Ligon, Dove of New Mexico, 1961.)

PRELIMINARY
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Although dove populations and habitat have not been intensively surveyed, the study area appears as typical to average dove habitat using standards described by Ligon (1961). Doves are frequently observed in the area. Based on harvest data, the fall dove population on NRL in the study area is an estimated 12,000. However, summer populations on NRL before fall migrations are believed to be in excess of 50,000 birds. (NDFG, Wildlife Estimates, 1976.)

PRELIMINARY DRAFT

Quail -- Two species of quail, scaled and valley, are known to exist from introductions in the study area.

Two hundred and fifty valley quail were released in the spring of 1971 at Moore's Creek, Peavine Canyon, Cloverdale Summit, and Stone Cabin Ranch. Of the birds released, only a small population still exists at Charnoc Field below Moore's Creek, at Moore's Creek, and at Moore's Creek Ranch. (NDFG, Wildlife Estimates, 1976.)

Scaled quail releases (25 pair) were made in Hot Creek Canyon in March 1973. Birds were known to bring off sizable broods that year and have not been observed officially since. However, they are believed established with unknown population levels.

Waterfowl -- The primary waterfowl and shorebird area within the study is in the Railroad Valley Wildlife Management Area (WMA). This complex of ponds, springs, and wells, supports an estimated 40 percent of the spring and fall waterfowl migration for the total area. Aerial surveys conducted by NDFG personnel indicate peak numbers of 2,500 waterfowl for the spring and fall migration periods. The area is used primarily during migrations, but a limited amount of nesting commonly occurs. The study area contributes only a small number of birds to the Pacific Flyway populations.

The remainder of the study area has numerous small waterfowl habitat areas, whose sources are small creeks, ponds, and lakes, where waterfowl and shorebirds are consistently found seasonally and occasionally year-long. (NDFG, Wildlife Estimates, 1976.)

PRELIMINARY DRAFT

The Railroad WMA was withdrawn in 1934 to be developed by the U.S. Bureau of Sports Fisheries and Wildlife. Responsibility was assumed jointly by the BLM and NDFG in 1950 for the administration of approximately 500 acres of created marshes and ponds. Much of this area dries up in late summer because of insufficient water. Primary waterfowl areas are Big Well (52 acres) and Lockes Ponds (130). In 1968, the withdrawn area was reduced from 133,391 acres (total dry lake area) to the present 14,720 acres (areas around each existing pond). These areas are currently fenced with livestock use regulated to meet waterfowl objectives.

The waterfowl habitat management techniques planned for the Railroad WMA are primarily related to producing desirable vegetation for waterfowl nesting cover and food. Livestock grazing is thought to be compatible with waterfowl objectives if grazing is introduced to periodically set back plant succession, thereby increasing plant vigor and density. Detailed information on waterfowl populations and management objectives is available in the Railroad Wildlife Habitat Management Plan (file code 6620) in the BLM district office in Battle Mountain, Nevada.

Other areas providing some waterfowl habitat within the study area include Little Fish Lake Valley and Big Smoky Valley. The waterfowl areas in Little Fish Lake Valley are perennial ponds fed by underground springs. The majority of waterfowl habitat within this valley falls within private lands, as is the case for Fish Springs. (About one-third of Little Fish Lake and approximately one-half of Upper Fish Lake is private.)

The waterfowl areas of Big Smoky Valley are confined primarily to reservoirs located on private lands. These areas usually contain water during the spring and fall periods with summer flows utilized for irrigation. Waterfowl and shorebirds use of these sites are necessarily restricted to the spring-fall months. Limited wet marshy areas are found on the NRL, interspersed with private holdings.

PRELIMINARY DRAFT

While the cover within the Railroad WMA is in relatively good condition, the banks of the other reservoirs noted and the majority of stream courses, are grazed heavily each year. Based on harvest data and questionnaire data compiled by NDFG, average fall waterfowl population is 14,000 ducks and 600 geese.

Birds of Prey (Raptors) -- Rocky cliffs, ledges, and canyons with aspen groves in the study area provide excellent nesting sites for eagles and hawks. (Seibert et al., Nesting Ecology, Eagles, 1976.) This habitat, combined with a diverse and relatively abundant small mammal population, makes the area productive habitat for birds of prey (raptors).

Birds of prey, which are yearlong residents of the study area, include the prairie falcon, golden eagle, red-tailed hawk, marsh hawk, and great-horned owl. The Swainson's hawk and American kestrel are common summer residents. The bald eagle, and peregrine falcon are possible winter residents. (See subsequent section, Endangered Species.)

Birds of prey have an indirect relationship to range forage and livestock grazing because of their position at the top of the food chain and because of their dependence on small animals as food. Vegetative condition has a direct affect on small mammal populations, their primary food source.

Other Bird Life -- Birds commonly using the study area within the course of a normal year are listed in the Wildlife Appendix G. Of the species listed, 140 are birds other than game birds or birds of prey. Since many of the species are highly mobile and commonly migratory, many species noted are temporary residents. Data is lacking as to specific use areas or densities; however, general comparison of available information and studies indicate that that diversity and density of most species increases as vegetation becomes more stratified. The greatest number and variety of birds should, therefore, be found in the riparian habitats where shrubs, grasses, and trees converge.

Marsh and riparian woodland type provides the preferred habitat for the largest variety and number of nongame birds. The following nongame birds are typical inhabitants of the major vegetative types found in the study area. Red-winged and yellow-headed blackbirds; large wading birds, such as sandhill cranes; snowy egrets and great blue herons; shorebirds, such as the American avocet; killdeer; and Wilson's phalarope are all characteristic of the limited areas of marsh, ponds, and streams. The gray warbler, Scott's oriole, common flicker, and the western kingbird are typically found in riparian woodlands.

The loggerhead shrike, Brewer's sparrow, and sage thrasher are characteristic of the sagebrush-shrub community; and the horned lark and western meadowlark are typical of the grassland communities. The sage thrasher, green-tailed towee, and rufous-sided towhee are found in the mountain-shrub community. Pinyon jay, scrub jay, and mountain bluebird are typical of pinyon-juniper woodlands. The Oregon junco, mountain chickadee, white breasted nuthatch, and

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Stellar's jay are characteristic in coniferous forests with the common nighthawk, common raven, and turkey vulture common in habitat types. The rock wren, prairie falcon, and golden eagle, are residents of rocky cliffs canyons.

Reptiles and Amphibians

Twenty-two species of reptiles and amphibians have been identified in the study area and adjacent terrain (Table II-22). Reptiles are widely distributed, with some species occurring in virtually every type of habitat and topography.

PRELIMINARY DRAFT

TABLE II-22
REPTILES AND AMPHIBIANS
IN TONOPAH STUDY AREA

Snakes

Common Name	Scientific Name
Rocky Mountain rubber boa	Charina battae utahensis
Western yellow-bellied racer	Coluber constrictor mormon
Red racer coachwhip	Masticophis flagellum piceus
Desert striped whipsnake	Masticophis toeniatus
Mojave patch-nosed snake	Salvadora hexalepis mojavensis
Great Basin gopher snake	Pituophis melanoleucus deserticola
California kingsnake	Lampropeltis getulus californiae
Western longnosed snake	Rhinocheilus lecontei lecontei
Wandering garter snake	Thamnophis elegans vagrans
Western ground snake	Sonora semiannulata
Nevada shovel-nosed snake	Chionactis occipitalis talpina
Desert night snake	Hypsiglena torquata deserticola
Great Basin rattlesnake	Crotolus viridis lutosus
Panamint rattlesnake	Crotalus mitchelli stephensi

Lizards

Zebra-tailed lizard	Callisaurus draconoides
Collared lizard	Crotaphytus collaris
Long nosed leopard lizard	Crataphytus wislizenii
Yellow-backed Spring lizard	Sceloporus magister uniformis
Great Basin fence lizard	Sceloporus occidentalis biseriatus
Northern sagebrush lizard	Sceloporus graciosus graciosus
Northern side-blotched lizard	Uta stansburiana stansburiana
Northern desert horned lizard	Phrynosoma platyrhinos platyrhinos
Great Basin skink	Eumcces skiltonianus utahensis
Great Basin whiptail	Cnemidophorus tigris tigris

Amphibians

Great Basin spadefoot toad	Scaphiopus intermontanus
Forest toad	Bufo boreas boreas
Pacific treefrog	Hyla regilla
Red-legged frog	Rana aurora
Leopard frog	Rana pipiens

NOTE: A more complete treatment of reptiles and amphibians is given in Appendix G .

PRELIMINARY DRAFT

Invertebrates and Microorganisms

Several species of insects, other invertebrates, and microorganisms found throughout the study area play significant roles in the biological communities. Some are foods for birds, frogs, toads, and small mammals, including bats. Larger insects, such as grasshoppers and beetles are at times food for foxes and coyotes. A list of known and assumed invertebrates occupying the study area is found in Appendix G .

Insects are a dynamic, poorly understood, component of the rangeland ecosystem. The complex interaction among and between both rangeland flora and fauna produces a balance at times highly unstable. A subtle rupture in this balance may result in a major insect outbreak. Some rangeland insects must be regarded as beneficial because they may provide either overt or subtle pressure to suppress an aggressive, undesirable plant. Thus, a desirable one may predominate. In some manner, excessive grazing by either insects or livestock may favor invasion by undesirable plants. Different insects produce different impacts on the range flora. Different plants, in turn, respond differently to rangeland abuse.

Soil Invertebrates: The soil fauna's primary function in any ecosystem is to decompose dead organic matter. Paris, Soil Fauna, (1969) concludes that decomposers are essential for maintaining equilibrium in the energy flow and nutrient cycling of the grassland in the North America ecosystem. Summarization of the functions of the major groups of soil animals is shown in Table II-23.

PRELIMINARY DRAFT

TABLE II-23
COMMUNITY FUNCTIONS OF SOIL ANIMALS

Taxonomic Group	Food	Community Function
Earthworms	Litter, mineral soil	Primarily decompose soil by comminuting litter, mixing soil and litter, producing crumb structure in soil
Mollusks	Green and dead forbs, fungi	Primarily decompose plants
Isopods	Litter	Comminute litter and some plants
Diplopods	Litter	Primarily decompose soil by comminuting litter
Dipterans	Litter, carrion	Primarily decompose carrion, also comminute litter
Coleopterans	Dung, carrion	Primarily decompose dung and carrion
Nematodes	Protoplasm of fungi, bacteria roots, small animals	Dissipate energy at a high rate, turn over nitrogen; influence on microbial populations uncertain
Enchytraeids	Fungi, bacteria	Function not well-known, but important to energy flow and probably to nutrient cycling
Collembolans	Fungi, bacteria, algae, fluids of plants and small animals	Comminute plant remains, disperse fungal spores; effects on microbial population uncertain
Mites	Fungi, bacteria, algae, small animals	Disperse fungal spores, comminute litter, influence on fungal populations uncertain
Ants	Omnivorous	Consume seeds; probably important to energy flow and may influence aphid populations, mounds and tunnels affect soil structures

Source: Paris, Soil Fauna, 1969.

PRELIMINARY DRAFT

Other invertebrates which exert major influence on plants or animals include the Bighorn sheep lungworm (Protostrangylus stilesi), and the land snails (mostly Vallonia pulchalla and Papilla blandi), which serve as alternate hosts. Large scale mortality in bighorn herds, attributed to the lungworm-pneumonia complex, is considered one of the bighorn's major limiting factors.

Other invertebrates listed include ticks, mosquitoes, and flies, which are biting pests. All are disease vectors for both humans and wildlife, especially mammals.

The interrelationship between species and flora is evidenced by the pine ingraver, Ips pini, which occasionally kills pinyon trees. The size of populations and affect on pinyon is influenced by competition between pine ingravers and other bark beetles. Natural predators which affect populations are woodpeckers, beetles, flies, mites, wasps, and nematodes.

PRELIMINARY DRAFT

Aquatic Habitat

The aquatic habitat within the unit is limited in scope, thereby limiting the diversity of fish present.

The distribution of native fishes in the area has been studied by Hubbs and Miller (Great Basin Relict Fishes, 1974). They reported three fish native to the area, the Railroad Valley springfish, the speckled dace, and the Tui Chub. All other species have been introduced.

Introduced trout species include Eastern brook, rainbow, brown, and cutthroat. The trout are limited mostly to streams within the study area. Other introduced species include largemouth bass, black bullheads, Sacramento perch, and bluegill. The latter are all warm water species capable of living in shallow lakes, ponds, and reservoirs scattered throughout the study area. Only largemouth bass and Sacramento perch were observed on recent surveys; however, the other two species were reported stocked by the Nevada Department of Fish and Game (NDFG) and are probably still present.

Habitat Condition: There are approximately 15 miles of perennial streams adjacent to NRL considered suitable habitat for fish within the 4.5 million acres. (See Table II-25, Summary of Streams Supporting Fish and Habitat Condition.) An additional 11 miles of streams on

PRELIMINARY DRAFT

TABLE II-25
SUMMARY OF STREAMS SUPPORTING
FISH AND HABITAT CONDITION
FOR THE TONOPAH STUDY AREA

Stream	Miles of stream on: BLM	FS	Private	Fish Species Present*	Condition BLM Habitat
Barker Creek (Shipley Creek)	.5	5.2	.2	BT, RT	----
Barley Creek	1.0	7.7	.8	BT, RT, BNT	Poor
Clear Creek	1.0	6.0	.1	BT, RT	Fair
Corcoran Creek	1.0	2.6	.7	RT, BNT	Poor
Danville Creek	1.2	5.1	.7	BT, RT	Fair
Hunts Canyon Creek	.5	7.7	1.5	BT	Poor
Mosquito Creek	1.0	6.5	1.5	BT, RT	Fair
Peavine Creek	.5	15	1.2	BT, RT, BNT, CT	Poor
Pine Creek	.5	5.5	2.5	BT, RT, BNT, CT	Fair
Six Mile Creek	6.0	--	.5	BT	Fair
Troy Creek	1.0	4.2	--	BT	Good
Moores Creek	.5	8.6	--	BT, RT, BT, CT	Good
Meadow Creek	.5	4.0	4.0	BT, RT	----
TOTAL	15.2	78.1	13.7		

Note: *Abbreviations used are: BT, Eastern brook trout; BNT, brown trout; RT, rainbow trout; CT, cutthroat trout.

Other abbreviations are: BLM, Bureau of Land Management; FS, U.S. Forest Service.

PRELIMINARY DRAFT

national forest lands are found within the area covered by grazing allotments in the Tonopah area. All streams, except Six Mile Creek, arise on national forest lands and flow onto national resource lands (NRL) for a short distance before either sinking into alluvial fans or being diverted for irrigation on private property.

Habitat conditions were determined for Six Mile Creek using methods similar to those described in technical note 283 by Duff and Cooper (Techniques Stream Survey, 1976). The remaining streams were surveys at a lower intensity to determine habitat condition.

Six Mile Creek, near Morey Peak, contains nearly one-third of the suitable stream habitat for trout within the area. Electro-fishing (a method of stunning fish so they can be counted) by NDFG biologists in September 1976, showed an Eastern brook trout population of nearly 1,500 fish per mile in Six Mile Creek. Barley Creek was also electro-fished. The portion of Barley Creek on NRL produced no fish while upstream on national forest lands a substantial population of 86 percent Eastern brook, 11 percent German brown, and 3 percent rainbow trout equalling 1,300 fish per mile was found. Photo Illustration II-8 shows Barley Creek as it occurs on NRL after leaving the forest and passing through private land. The remaining streams on NRL supports trout populations somewhere between the condition found in Six Mile Creek and that portion of Barley Creek that contained no fish.

PRELIMINARY DRAFT

Illustration II-8 Barley Creek, Monitor Valley, before sinking into the alluvial fan. This stream is typical of many streams in the area.

The quantity and quality of the aquatic habitat created by lakes, ponds, and reservoirs within the study area fluctuates considerably with precipitation patterns. During periods of drought, the habitat shrinks and the quality declines. During periods of plentiful rainfall, the habitat expands and the quality improves. Table II-26 list the waters and condition of the habitat. Table II-27 lists the variety of fish in the area.

PRELIMINARY DRAFT

TABLE II-26
LAKES, PONDS, AND RESERVOIRS
WITHIN THE TONOPAH STUDY AREA*

Ponds-Lakes-Reservoir	Surface Acres	Fish Present	Habitat Condition
Little Fish Lake	80	Tui chub, Black bullhead	Fair
Echo Canyon Reservoir	5		Poor
Seylor Reservoir	10		Poor
Stone Cabin Reservoir	1	Tui chub	Poor
Lockes Pond	130	Largemouth bass	Fair
Big Well #1	52	Sacramento perch	Fair
Well #2	90		Poor
Well #3	90		Poor
Well #4	90		Poor
North Well	30		Poor
Blue Eagle	30		Fair
TOTAL	609 Acres **		

Notes: *All but 97 acres are within the Railroad Valley wildlife habitat area.
** This includes Riparian habitat, marshes, etc., not just surface acres of water.

PRELIMINARY DRAFT

TABLE II-27
COMMON AND SCIENTIFIC NAMES OF FISHES
FOUND IN THE TONOPAH STUDY AREA

Common Name	Scientific Names
Cutthroat trout (threatened)	Salmo clarki henshawi
Rainbow trout	Salmo gairdneri
Brown trout	Salmo trutta
Brook trout	Salvelinus fontinalis
Tui chub	Gilia bicolor
Speckled dace	Rhinichthys osculus
Black bullhead	Ictalurus melas
Railroad Valley killifish	Crenichthys nevadae
Sacramento perch	Archoplites interruptus
Largemouth bass	Micropterus salmoides
Bluegill	Lepomis macrochirus

PRELIMINARY DRAFT

Little Fish Lake is the largest lake in the area. Approximately two-thirds of the shoreline is on NRL. Photo Illustration II-9 shows part of the lake and the alkali deposits around the shoreline. Water quality is below the range for good fish habitat with a pH of 9.6 and total dissolved solids (TDS) near 16,000 parts per million (ppm).

Illustration II-9 Little Fish Lake is the largest body of water in the unit. Water quality is poor with a pH of 9.6 and total dissolved solids of 16,000 milligrams per liter (mg/l.). Notice white alkali deposits along shoreline.

PRELIMINARY DRAFT

Tui chubs are present in Little Fish Lake.

The Railroad Valley Habitat Management Plan (HMP) covers 14,720 acres of aquatic habitat in Railroad Valley. Most of the important riparian areas are fenced and livestock use is limited by the objectives of the HMP.

For a photo of the largest stream in the area, see Illustration II-10.

Illustration II-10 Mosquito Creek, Monitor Valley, is one of the study area's largest streams. It lacks vegetative cover and stream bank stability.

PRELIMINARY DRAFT

Threatened or Endangered Species

There are no known animal species determined "threatened" or "endangered" by the U.S. Department of the Interior which inhabit or depend on national resource land habitat within the Tonopah study area. The southern bald eagle and peregrine falcon are on the Department of Interior's 1974 list of endangered fauna. Individuals of these highly mobile species may pass through the area, but none are known to frequent the area.

The State of Nevada Board of Fish and Game Commissioners has classified the peregrine falcon as endangered species within Nevada. The spotted bat, and Railroad Valley springfish are classified as rare species. See Table II-28 , Endangered, Rare and Protected Species, for a listing of protected species within the Tonopah study area.

PRELIMINARY DRAFT

TABLE II-28
ENDANGERED - RARE AND PROTECTED SPECIES
(TONOPAH STUDY AREA)

Species	Status	Source of Status
Southern bald eagle *Haliaeetus leucocephalus*	Endangered	United States
American peregrine falcon *Falco peregrinus anatum*	Endangered	United States
White-faced glossy ibis *Pelegadis chihi*	Undetermined	United States
Ferruginous hawk *Buteo regalis*	Undetermined	United States
Pigeon hawk *Falco columbarius*	Undetermined	United States
Snowy plover *Charadrius alexandrinus*	Undetermined	United States
Mountain plover *Eupoda montana*	Undetermined	United States
Longbilled curlew *Numenius americanus*	Undetermined	United States
Prairie falcon *Falco mexicanus*	Endangered	Nevada
Spotted bat *Euderma maculata*	Rare	Nevada
Railroad Valley springfish *Crenichthys nevadae*	Rare	Nevada
Kit fox *Vulpes macrotis*	Protected	Nevada Fish and Game
Pika *Ochotona princeps*	Protected	Nevada Fish and Game
Bald eagle *Haliaeetus levcocephalus*	Protected	Nevada Fish and Game
Golden eagle *Aquila chrysaetos*	Protected	Nevada Fish and Game

PRELIMINARY DRAFT

Species	Status	Source of Status
Pigeon hawk *Falco columbarius*	Protected	Nevada Fish and Game
Sparrow Hawk *Falco sparverius*	Protected	Nevada Fish and Game
Coopers hawk *Accipiter cooperi*	Protected	Nevada Fish and Game
Ferruginous hawk *Buteo regalis*	Protected	Nevada Fish and Game
Goshawk *Accipiter gentilis*	Protected	Nevada Fish and Game
Harris hawk *Parabuteo unicinctus*	Protected	Nevada Fish and Game
Marsh hawk *Circus cyaneus*	Protected	Nevada Fish and Game
Red tailed hawk *Buteo jamaicensis*	Protected	Nevada Fish and Game
Rough-legged hawk *Buteo Lagopus*	Protected	Nevada Fish and Game
Sharp-shinned hawk *Accipiter striatus*	Protected	Nevada Fish and Game
Swainson's hawk *Buteo swainsoni*	Protected	Nevada Fish and Game
Kingfisher *Megaceryle alcyon*	Protected	Nevada Fish and Game
Nighthawk *Chordeiles spp*	Protected	Nevada Fish and Game
Barn owl *Tyto alba*	Protected	Nevada Fish and Game
Burrowing owl *Speoyto cunicularia*	Protected	Nevada Fish and Game
Great horned owl *Bubo virginianus*	Protected	Nevada Fish and Game

PRELIMINARY DRAFT

Species	Status	Source of Status
Long-eared owl *Asio otus*	Protected	Nevada Fish and Game
Short-eared owl *Asio flammeus*	Protected	Nevada Fish and Game
White pelican *Pelecanus ergthrorhynchos*	Protected	Nevada Fish and Game
Turkey Vulture *Cathartes aura*	Protected	Nevada Fish and Game
White-faced glossy ibis *Pegadis chihi*	Protected	Nevada Fish and Game

DEFINITION AND SOURCE OF STATUS

Endangered - United States. "Those species in danger of extinction throughout all or a significant portion of their range." United States' list of Endangered Fauna, May 1974, United States Department of Interior.

Endangered - Nevada. "Those species in danger of extinction throughout all or a significant portion of their range." State of Nevada, Board of Fish and Game Commissioners, General Regulations No. 1, Ammendment No. 5.

Rare - Nevada. A rare species is one that although not presently threatened with extinction is in such small numbers throughout its range that it may be endangered if its environment is adversely affected.

Protected - Nevada. An animal which may not be taken in any way, shape, or form.

PRELIMINARY DRAFT

Lahontan cutthroat trout are listed as threatened in the 1975 Federal Register, Vol. 40, No. 188. Peavine, Pine, and Moore's Creeks have been stocked by the Nevada Department of Fish and Game with cutthroat trout (assumed to be Lahontan). All of the streams listed as containing cutthroat also contain rainbow trout. Behnke (Salmonid Systematic, 1972) stated that mass hybridization takes place when rainbow trout are introduced into waters with inferior cutthroat trout. Because of the hybridization with rainbow trout, no major population of genetically pure Lahontan cutthroat trout exists in the area.

One species of fish, the Railroad Valley Springfish, Crenichthys nevadae, is endemic to Railroad Valley and is classified as rare (Nevada Fish and Game Regulation No. 1). This species occurs in one spring on NRL [illegible] within the study area. Springfish require warm springs as suitable habitat.

The White River spinedace, Lepidoneda albivallis, a rare fish, was formerly found at Big Well in Railroad Valley (LaRivers, Fishes and Fisheries, 1962). Big Well was resurveyed in September 1976, and no spinedace were found. Sacramento perch, a predator, was found present in Big Well.

PRELIMINARY DRAFT

Wild Horses

The Tonopah study area provides habitat for an estimated 1,676 wild horses located in 14 distinct herd areas. Herd area boundaries and numbers were identified by the Bureau of Land Management (BLM) in the unit resource analysis (URA) for the Tonopah Resource Area, 1975. These findings are shown on the Herd Use Area Map. Within each herd area are individual bands ranging in size from one to fifteen animals (Green, personal communication, 1976). The average band consists of six horses.

Inventories and Productivity

Attempts were made to determine the number of wild horses existing in the study as early as 1957 when the Battle Mountain District Manager estimated numbers based on visual sightings and knowledge of field personnel. This effort was followed by a joint BLM-District Advisory Board estimate in 1966. From 1967 to 1973 sporadic aerial inventories were conducted by the BLM culminating in an intensive helicopter inventory in 1975 from which current estimates are derived. See Table II-29, Wild Horse Numbers and Forage Demand, and Table II-30, Summary of Inventories and Estimates.

PRELIMINARY DRAFT

WILD HORSE HERD USE AREA MAP

TABLE II-29
WILD HORSE NUMBERS AND FORAGE DEMAND

Herd Use Area	Allotment	Number	Forage Demand (AUMs)
Ione	Ione San Antonio	15	180
Monte Cristo	Esmeralda	100	1,200
Lone Mountain	Esmeralda	20	240
Saulsbury	Hunt's Canyon	various	50 *
Saulsbury	Ralston	various	20 *
Hunt's Canyon	Hunt's Canyon	12	12
North Willow Creek	Willow Creek	24	30
Willow Creek	Stone Cabin	143	1,777
Stone Cabin	Stone Cabin	571	7,107
Little Fish Lake	Wagon Johnnie Page Springs	99	1,104
Upper Hot Creek and Sand Springs	Sand Springs Morey	17	101
Park Mountain	Sand Springs	35	420
Hot Creek	Hot Creek	25	300
South Pancake	Crater Black Rock	31	372
Reveille	Reveille	625	2,400
Total		1,717	15,313 *

* Estimated Source: Battle Mountain District Office, BLM, Tonopah Unit Resource Analysis, 1975.

PRELIMINARY DRAFT

TABLE II-30 PRELIMINARY DRAFT

SUMMARY OF INVENTORIES AND ESTIMATES OF HORSE NUMBERS

Herd Area	1957	1966	1967	1969	1973	1974	1975	1976
Ione	DM Est. 20 a/	DM Est. 30				Inventory 10 b/		DM Est. 15
Monte Cristo							Inventory 100	Est. 100
Lone Mountain							Inventory 45 H 2 B	Est.
Saulsbury	DM Est. 40					Inventory 11		USFS Est. c/ 76
Hunt's Canyon								USFS Est. 12
North Willow Creek								USFS Est. 24
Willow Creek and Stone Cabin	DM Est. 50	DM-Adv Bd Est d/ 125-150	Inv. 139	Inv. 288	Inv. 748	Inv. 917		DM Est. 714
Little Fish Lake	DM Est.	DM-Adv. Bd Est. 50			Inv. 117		Inv. 85	DM Est. 99
Upper Hot Creek							Inv. 11	DM Est. 11
Sand Springs		DM Est. 120		Inv. 28			Inv. 6	DM Est. 6
Park Mountain						Inv. 33		DM Est. 35
Hot Creek		DM-Adv. Bd. Est. 40					Inv. 23	DM Est. 25
South Pancake							Inv. 13	Inv. 31
Reveille	DM Est. 50	DM-Adv. Bd. Est. 250		Inv. 137	Inv. 260	Inv. 421	DM Est. 470	DM Est. 625

a/ District Manager estimated
b/ Aerial inventory
c/ U.S. Forest Service estimate
d/ District Manager - Advisory Board estimate

SOURCE: Battle Mountain District Office, BLM, Wild Horse and Burro Proposed Managment Plan, 1975.

PRELIMINARY DRAFT

Rates of increase in herd size were computed by the BLM assuming an annual rate of increase of 12 or 18 percent, depending on the herd. These rates were derived by counting foals in the spring and assuming 100 percent survival of all foals born, with no mortality among older animals(Wild Horse and Burro Proposed Management Plan, 1975). These assumptions caused error in calculating herd size for the above plan.

Another method used in calculating rates of increase in herd size was to take the difference between aerial inventories conducted in the different years of survey.

The difference was assumed to be the actual rate of increase. Bias also exists in this method; aerial surveys are considered to be only a rough method of estimating the size of a population (Caughley, "Aerial Surveys", 1976). In the past, aerial surveys conducted in the study area were not comparable in types of aircraft used, height flown, pattern, or season of year. Different observers were involved in most surveys. One author concluded that observed densities cannot be directly compared between two surveys flown at different heights, at different speeds, or utilizing different transect widths. (Caughley, "Aerial Surveys", 1976.)

Green, investigating the Stone Cabin and Willow Creek herd areas in 1976, determined that the yearling segment of these herds consisted of approximately 10 yearlings per 100 adult horses. (Green, personal communication, 1976.) Subtracting an average adult mortality of four percent from the yearling figure gives an approximate annual increase of six percent in the Stone Cabin and Willow Creek herd areas for 1976. (See Appendix H, Methodology for Computing Increase.) The Battle Mountain District considers these herds to be among the most productive in the study area.

During 1975 and 1976, about 400 horses were trapped in the Stone Cabin and Willow Creek herd areas. Data based on these roundups shows 19 colts per 100 adults in 1975, and 32 colts per 100 in the spring of 1976. By August of 1976 an aerial survey indicated that the number of colts per 100 adults had dropped to 18. (Battle Mountain District Office records, 1976.)

In these herd areas, colt mortality appears to occur evenly from early summer through late winter.

In the Stone Cabin and Willow Creek herd areas, foaling starts about the first part of April and is essentially completed by the first of June. Thus, most breeding takes place between the middle of February and the first of May. (Green, personal communication, 1976.)

Based on the 400 horses trapped in the Stone Cabin - Willow Creek herd areas, the sex ratio is 48 percent, males; 52 percent, females. This closely corresponds to Green's field observations of 47 percent males and 53 percent females. (Green, personal communication, 1976.)

Data on colt mortality and mare productivity are incomplete for herds of the study area; however, studies indicate general fertility rates for free-roaming horses on range conditions rarely exceed 60 percent. Also, very young mares, as well as old mares, appear to have a lower fertility rate than mares of intermediate ages (Speelman, Aspects of Fertility, 1974).

From data gathered during 1976 trapping operations, productivity in the Stone Cabin and Willow Creek herds was close to the 60 percent fertility rate. Productivity and types, causes, and periods of colt mortality need to be investigated for all herd areas.

PRELIMINARY DRAFT

Inbreeding among wild horses generally does not result in debilitating charactertistics. Leopold (Game Management, 1933) states that wild populations are subjected to a rigorous selection process incident to survival; therefore, the frequency of variation (or defect) is greater in domestic species than in wild populations. Though the wild horses in the study area have been introduced, and evolved from domestic stock, there is no reason to believe they would now be different from other wild populations in this respect. Changes in conformation and size of wild horses are more likely attributable to survival requirements than to inbreeding.

Home Range

Bands in all herd areas are thought to establish home ranges by season, but little data on ranges exists in most of the study area. Green, in his studies of the Stone Cabin herd, recorded home ranges for six bands. There is a high degree of overlap among all home ranges recorded. Areas encompassed by band home ranges varied from 4.2 square miles to 30.2 square miles (Green, personal communication, 1976). The Stone Cabin herd is the only one for which home ranges have been plotted.

Seasonal Movement and Herd Areas

The extent of seasonal movement is unknown in most herd areas. Some gross movement has been recorded by field personnel, but quantifiable data does not exist.

PRELIMINARY DRAFT

The Ione herd is believed to drift among the Carson City, Battle Mountain, and Las Vegas BLM Districts' areas. The extent of the drift, or whether it is seasonally related, is not known (Wild Horse and Burro Proposed Management Plan, 1975).

The Saulsbury herd unit is separated from the Stone Cabin herd by the Yellow Cone Fence. This fence is open at both ends, though the only significant drift is around the north end. During dry periods the majority of this herd ranges across the extreme south end of the Monitor Range within the Toiyabe National Forest boundaries. Winter and spring find a few bands south of the national forest boundary. Heavy snow at higher elevations force horses onto NRL or the alluvial fans immediately adjacent to the national forest north of Thunder Mountain (Kizer, personal communication, 1976).

There has been no recorded seasonal movement in the Monte Cristo and Lone Mountain herd areas (BLM, Esmeralda URA, 1975). It has been observed, however, that some amount of seasonal movement does occur between the higher elevations of the Monte Cristo Range and the benches and alluvial fans to the north and west (Pheiffer, personal communication, 1976).

Use in the Hunt's Canyon herd area is a result of seasonal movement during extreme winters from the Toiyabe National Forest to national resource lands (NRL) between Hunt's Canyon and White Rock Canyon (Kizer, personal communication, 1976). The horses move back onto the National Forest in the spring. The North Willow Creek herd is separated from the Willow Creek herd by a fence completed in 1976 at the south edge of the herd area. Before

the fence was constructed, this herd was considered part of the Willow Creek herd. The North Willow Creek herd summers on the Toiyabe National Forest and utilizes national resource land (NRL) during the winter. Seasonal movement data on the herd is incomplete, however.

The Willow Creek herd area is separated from the Stone Cabin herd area by a low range of hills. The Willow Creek herd area is divided between the Toiyabe National Forest and adjoining NRL. A portion of the herd summers every year at higher elevations on the National Forest, utilizing the lower areas along the National Forest boundary during winter. Much of the herd remains near the National Forest boundary yearlong, moving higher and lower with the snowline during winter. Overall there is a general seasonal movement to lower elevations during winter and to higher elevations during summer, though much of the short term movement is weather related.

Seasonal movement of the Stone Cabin herd was specifically noted during 1975 and 1976 (Green, personal communication, 1976). A general north in the summer, south in the winter movement observed by BLM field personnel was confirmed. In 1976, horses moved into the northern portion of Stone Cabin Valley by the latter part of April or the first part of May. At that time horses were well distributed throughout the length of Stone Cabin Valley. (Green, personal communication, 1976). From observations by BLM field personnel, there is believed to be a general movement of the Stone Cabin herd south in the winter to the Nellis Air Force bombing range and then northward in the summer into Stone Cabin Valley (Tonopah URA, 1975). Currently (1976) a fence is under construction along the bombing range boundary which will halt, this north-south seasonal movement.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

The Little Fish Lake herd moves with the seasons very much like the Willow Creek herd (Kizer, personal communication, 1976; Baldwin, personal communication, 1976). There are, however, probably fewer horses, relative to the total, which winter on NRL in the Wagon Johnnie allotment. This is because the National Forest boundary extends farther down onto the benches and fans in this valley than it does in Stone Cabin Valley.

The Upper Hot Creek and Park Mountain herd areas are extensions of larger horse herds in the Ely BLM District. The southwestern portions of these herd areas extend into the study area. Seasonal movements are unknown.

The Sand Springs herd area is also inter-district, divided between the Ely and Battle Mountain districts. Horses move freely between the two districts. The study area provides summer habitat. Most movement is considered water-related (Wild Horse and Burro Proposed Management Plan, 1975). Drift to the south and southeast into the study area is controlled by a fence and the Pancake range.

The Hot Creek herd area has no recorded information on seasonal herd movements (Tonopah URA, 1975), though it seems reasonable these horses range to higher elevations during summer and to lower elevations during winter.

The South Pancake herd unit appears to have no seasonal movement This herd is isolated. Water is well distributed (Tonopah URA, 1975).

PRELIMINARY DRAFT

The Reveille herd area appears to have substantial seasonal movement. An unquantified drift occurs to and from the west over the Kawich Range and to and from the Kawich Valley to the south. Therefore, the Nevada wild horse range and the Nellis Air Force bombing and gunnery range are involved since there are no barriers between these areas. During the summer the horses move from the Kawich Valley north into Reveille Valley; they return to the south in the winter (Tonopah URA, 1975).

Daily movement is generally feed-water related. During late spring, summer, and early fall, horses water at least once a day, usually in the late evening or early morning. After watering, the animals feed away from water, repeating this pattern the following day. If water is not well distributed or as water sources fail in late summer, horses will trail as far as eight or ten miles from feed to water. In the winter, daily movement becomes less as living space is reduced by snow in the higher portions of the herd areas. The horses utilize snow for water.

Quantified information concerning seasonal use areas within each herd area is not available except for limited data compiled on the Stone Cabin and Willow Creek herds.

Between March 19, 1976, and August 19, 1976, concentrations of horses were noted south of Highway 6 on the east side of Stone Cabin Valley (T. 2 N., T. 3 N., R. 48 E.) and north of Highway 6 northeast of Stone Cabin Ranch (T. 4 N., T. 5 N., R. 48 E.) in the Stone Cabin herd area (Green, personal communication, 1976).

PRELIMINARY DRAFT

PRELIMINARY DRAFT

During the same time, horses were concentrated along the BLM - National Forest boundary between Warm Spring and McCann Canyon (T. 6 N., R. 48 E.) in the Willow Creek herd area (Green, personal communication, 1976).

Habitat Requirements and Food Habits

Detailed information on habitat requirements is lacking for all herd areas within the study area, consequently no crucial areas have been identified.

Cover is provided by both vegetation and topography. In the hot summer months, horses spend some time in small areas of riparian vegetation, but often seek shade in available pinyon-juniper stands. Higher elevations provide a cooler summer environment vantage point and an escape from flies and other pests. On windy days, horses have been observed laying in large patches of sagebrush for protection from the wind. During winter, natural terrain features such as, hills and rock outcrops, seem to offer the cover most often utilized for protection. Cover requirements for foaling areas are not known.

Horses generally prefer grasses during the late spring, summer, and early fall. During the winter, early spring, and late fall (the nongrowing season), the horses begin using less grass and eating more shrubs. During this period, these plants are relatively high in Vitamin A, protein, and phosphorus, whereas, grasses are likely to be higher only in energy (Cook, et al., Nutritive Value, 1954).

PRELIMINARY DRAFT

Fecal analysis studies run on wild horses in the Duckwater area of the Ely BLM District show that in that area grasses are 90 percent of the horses' diet in the spring, 92 percent in the summer, 12 percent in the fall, and 19 percent in the winter. Shrubs consisted of 8.5 percent of the diet in the spring, 7.5 percent in the summer, 87.5 percent in the fall, and 78 percent in the winter. The remainder of the diet consisted of forbs (Ely BLM, Fecal Analysis, 1975). The fecal analysis study area was located in the main portion of the Upper Hot Creek and Sand Springs herd areas. The habitat types are similar to those types utilized by horses in many of the herd areas within the Tonopah study area.

Forage availability is most limited during the winter; however, this only affects those horses that have mountain ranges within their herd areas where snow annually covers the ground.

Vegetation throughout the herd areas is characterized by salt desert shrub, sagebrush-grass, and pinyon-juniper habitat types. There is some degree of use in all of these habitat types year-round but the pinyon-juniper is used primarily in the summer months; the salt desert shrub, during the winter; and sagebrush-grass during all seasons.

Within each herd area there are few areas with no potential for horse use. Horses are able to utilize higher, steeper country than cattle and are often concentrated in these areas. Forage is generally better in higher areas because of lack of competition from other grazing animals.

PRELIMINARY DRAFT

Water

Currently the supply and availability of water for wild horses is estimated to be adequate. While no quantitative data are available concerning total demand for water at each source versus water production, information from Bureau field personnel and local residents indicates an adequate supply. Water is available year-round to wild horses from springs, streams, and wells. During the winter and spring, dry lake beds and potholes, intermittent streams, and wet weather springs provide additional watering places.

Two classifications of water sources are identified on the map of Herd Use Areas; these are "important" waters and "crucial" waters. "Important" waters are the predominant sources of water used as part of the yearlong habitat. "Crucial" waters are those which are the limiting factor of a given habitat; that is, a given band or herd cannot exist without those waters.

In the Stone Cabin, Willow Creek, Ione, Little Fish Lake, and Saulsbury herd areas, the important waters are known. In the other herd areas, they are not specifically known, though it is assumed all permanent water sources within each herd area are important. These are identified on the map of Herd Areas and Important Waters. Crucial waters have been identified only in the Stone Cabin Valley. In other areas, specific information on crucial waters is not available, though it is quite possible water is not the limiting factor since perennial water is generally abundant enough that if one source becomes unavailable, another can be used.

The ownership and control of important and crucial waters is shown on the Herd Areas and Important Waters Map. Except for the Reveille herd area, much of the water used by wild horses is federally owned or controlled. The BLM, in cooperation with ranchers,has developed existing sources, such as wells primarily for livestock. Under the agreement, the water is for multiple-use, including wild horses, with the development being maintained by the operator. At undeveloped springs on federal land, use by wild horses gives the government a right to the amount of water used. Streams are similar, unless the water has been claimed or awarded to a former or existing user. Generally, such claims are far in excess of actual use. Information on such claims, or "filings", is not immediately available; it does exist in the office of the State Engineer. In the Reveille herd area, nearly all water rights and facilities at waters known to be used by wild horses are privately owned or controlled. In most of these cases, however, the property at the location is federally owned. These facilities were constructed under the Taylor Grazing Act which authorizes private developments on federal land with BLM approval. Wild horses currently use these waters without interference from the owner. Whether this situation will continue is unknown.

No reservation or formal allocation of water for wild horses has been made. The Management Framework Plan (MFP) decision on wild horses for the Tonopah Resource Area (1976) specifically deleted any allocation of water for wild horses. This was done because specific water sources were not identified in that document, and because current sources and proposed water developments should provide sufficient water for wild horses.

PRELIMINARY DRAFT

Competition

Competition between wild horses and other grazing animals is modified by both diet similarity and habitat overlap. Both cattle and horses depend heavily on grasses during the spring and summer, hence, the degree of dietary overlap is substantial during these periods. Actual competition for preferred plants is lessened by the fact that horses prefer higher and steeper country and generally feed farther from water.

Competition between deer and wild horses is assumed, but quantifiable data is not available. There seems to be potential for competition in the spring when both animals are utilizing new growth. There is also potential for competition during the winter when both animals are heavily dependent upon shrubs. Habitat overlap between these two species varies from herd area to herd area, but most habitat overlap appears to occur primarily in the summer when horses depend mostly on grass and deer on forbs and browse.

Competition between wild horses and antelope does not appear to be significant. Fecal analysis studies completed on an area similar to the study area indicated no significant diet overlap during any season (Ely BLM, Fecal Analysis, 1975). Horse and antelope habitats do overlap to a large extent.

Competition for water exists only if quantity is insufficient to supply all animals utilizing the source. Horses are very mobile and will go as far as eight to ten miles, one way, for water. Horses defending or driving other animals from water sources has not been recorded.

PRELIMINARY DRAFT

Range Condition

Quantitative data available on range condition for wild horses are derived from watershed inventories. For the Stone Cabin, Willow Creek, and North Willow Creek herd areas, this information has been specifically calculated. For other areas, it is available only by grazing allotment. Table II-31, Range Condition for Horses, shows condition on those allotments which contain wild horses.

Four study plots (range trend plots) were established in Stone Cabin Valley during 1972. Photos were taken at the time of establishment and again in 1974. These photos tend to corroborate the general deterioration of range condition indicated in Table II-31, Range Condition for Horses. These photos can be seen in the BLM Battle Mountain District Office.

The generally poor range condition indicated in Table II-31, Range Condition for Horses, may be somewhat overstated. The same criteria were used for determining range condition for horses as for cattle. Horses generally travel farther from water than cattle, utilize rougher and steeper terrain, and are able to subsist and do well on a wider variety of forage plant species than can cattle. For these reasons, range conditions for horses may be somewhat better than indicated in Table II-31. Whether these factors are sufficient to change any of the condition classes given is problematical. Each class is necessarily quite broad.

PRELIMINARY DRAFT

TABLE II-31

RANGE CONDITION FOR HORSES

Allotment	Herd Area	Condition					
		Good		Fair		Poor	
		Acres	Percent of Area	Acres	Percent of Area	Acres	Percent of Area
Ione	Ione	2,400	1	139,334	64	95,500	35
San Antonio	Ione	15,510	4	269,820	61	156,490	35
Esmeralda	Esmeralda Lone Mountain	----------Not Available----------					
Hunt's Canyon	Saulsbury Hunt's Canyon	6,270	6	18,597	17	81,490	77
Wagon Johnnie	Little Fish Lake	52,475	13	160,350	40	186,720	47
Stone Cabin - Willow Creek	Stone Cabin Willow Creek N. Willow Creek	42,549	11	130,903	33	225,674	56
Crater Black Rock	South Pancake	20,865	20	49,483	48	32,471	31
Sand Springs	Sand Springs Upper Hot Creek	27,080	10	105,365	53	67,220	37
Hot Creek	Hot Creek	37,035	21	64,174	36	76,084	42
Morey	Park Mountain	0	0	10,828	9	105,319	91
Reveille	Reveille	----------Not Available----------					

Source: Battle Mountain District Office, BLM, Allotment Management Plans, 1976.

PRELIMINARY DRAFT

Visual Resources

The Tonopah study area contains a variety of distinguishing landforms, rock formations, water-forms, and vegetative patterns which make up its characteristics visual landscapes. The area is located in what is known as the Basin and Range physiographic province. It has been described as a high windswept plateau, of a scale so vast that only the horizon limits the view. The connotation of "Basin" is misleading, since Central Nevada country is not a deep, walled-in basin which creates a feeling of closeness, but rather one which leaves the viewer with an impression of distance and emptiness.

Complexes of hills and long, north-south trending mountain ranges border desolate valleys to give the area much of its interest value. Landforms dominate most views, since colors tend to be drab. They are hues of grays, greens or browns with little color variation to attract the eye. Textures and lines blend and flow throughout most scenes in almost endless variety.

Mountain landscapes are dominated by high peaks and ridges, narrow, winding canyons separated by sharp ridges, and strong horizontal lines of contrast where their bases meet the valley floors below. Panoramic views from major travel routes may include several mountain ranges at varying distances. Colors, textures, and lines tend to fade and blend into distant mountain ranges. When viewed in the foreground or middleground, the rugged rock outcrops and stringers and patches of dark green trees that cover the slopes add variety and interest to repetitious upland forms. Foothills and alluvial fans provide a visual transition between massive, rugged mountain ranges and the flat, light-colored valley floors. These features

PRELIMINARY DRAFT

tend to have a greater variety of colors, textures, and forms than valleys. They remain subordinate to the mountains, directing attention upward along ridges or green stringers of vegetation that follow canyons toward the peaks above. Alluvial fans and foothills are more accessible than steeper slopes, and have suffered more visible intrusions from roads. They appear very sensitive to changes since they seem visually superior to monotonous valley landscapes, yet exposed to view at "eye level", and somehow less capable of concealing the effects of man's activities than mountains and canyons.

Although they possess a stark beauty that can be appreciated for its vast open spaciousness, the valleys of the study area tend to be monotonously flat, dry, and forbidding. This is especially true of the broad, treeless flats in Railroad, Stone Cabin, and Big Smoky Valleys, while the smaller valleys at higher elevations, such as Little Fish Lake and Monitor Valleys, provide more middleground views with a greater abundance and variety of vegetation, textures, and color patterns. The strongest elements in the valley landscape are horizontal lines. Colors are generally light hues fading into white on dry playas, while textures change subtly over broad vegetation types. Distinctive landforms are virtually absent.

Several high-quality scenery areas were identified in a Unit Resource Analysis (URA) sightseeing resource inventory. These features received "A" ratings, and generally are popular sightseeing attractions in the study area.

PRELIMINARY DRAFT

The Tonopah Management Framework Plan (MFP) lists 21 designated scenic zones to be established to protect natural and cultural sightseeing resources, including the 17,680 acre Six Mile Back Country Use Area and the 14,800 acre Morey Peak Primitive Area in the Hot Creek Range. Other sites listed in Table II-32, Recreation Resources, will be protected from any activity which would impair scenic quality by buffer zones from one-half mile up to two miles radius.

PRELIMINARY DRAFT

TABLE II-32
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
Campgrounds						
Berlin-Icthyosaur State Park	Nevada State Park	1	560	Sightseeing-Camping	10,000	Combines Berlin Historic State Park and icthyosaur paleonthology display 14 campsites; $2.00 fee/night
Peavine Creek Campground	U.S.F.S.	2	N/A	Fishing-Camping	4,000	7 family units; 1 group unit; no fee
Pine Creek Campground	U.S.F.S.	3	N/A	Fishing-Camping	4,000	25 family units; no fee
Cherry Creek Campground	U.S.F.S.	4	N/A	Fishing-Camping	400	10 family units; no fee
Rest Areas						
Blue Jay Roadside Rest	Nevada Highway Department	5	.5	Rest Stop-Sightseeing	1,000	Shade, picnic facilities, toilets One night camping only
Salisbury Roadside Rest	Nevada Highway Department	6	.5	Rest Stop-Sightseeing	8,000	Shade, picnic facilities, toilets One night camping only
Millers Roadside Rest	Nevada Highway Department	7	.5	Rest Stop-Sightseeing	1,000	Shade, picnic facilities, toilets One night camping only
Carvers Roadside Rest	Nevada Highway Department		.5	Rest Stop-Sightseeing	1,000	Shade, picnic facilities, toilets One night camping only
National Historic Register Sites						
Tybo Charcoal Kilns	BLM	8	60	Historical Sightseeing	100	60 acres will be withdrawn
James Wild Horse Trap	BLM	9	80	Historical Sightseeing	N/A	80 acres will be withdrawn

PRELIMINARY DRAFT

TABLE II-32
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
National Register of National Landmarks Site						
Lunar Crater	BLM	10	2,500	Geological Sightseeing	400	Maar Volcano Crater; 1,200 acres withdrawn from mineral entry
Historic Highway Markers						
Tonopah	Nevada Highway Department	11	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Tybo	Nevada Highway Department	12	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Belmont	Nevada Highway Department	13	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Manhattan	Nevada Highway Department	14	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Round Mountain	Nevada Highway Department	15	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Big Smoky Valley	Nevada Highway Department	16	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Ophir	Nevada Highway Department	17	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Ione	Nevada Highway Department	18	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities

PRELIMINARY DRAFT

TABLE II-32
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
Lakes and Reservoirs						
Lockes and Big Well Ponds	BLM/Nevada Fish and Game	19	182	Fishing-Waterfowl Hunting	250	Located within Railroad Valley Wildlife Management Area
Rye Patch Reservoir	Private	20		Fishing-Picnics	100	
Moores Station Reservoir	Private	21		Fishing-Hunting	100	
Little Fish Lake	BLM/Private	22	30	Waterfowl Hunting	10	
Railroad Valley Pond	BLM/Nevada Fish and Game	23		Fish-Hunting	3	Railroad Valley Wildlife Management Area
Fishing Streams						
Six Mile Creek	BLM	38	15 (Stream Miles)	Trout Fishing	205	Back Country Use Area-Charcoal kilns, hunting, camping
Barley Creek	U.S.F.S/BLM	24	2 mi. BLM 8 mi. USFS	Trout Fishing	713	1973 Use Figures for all streams
Clear Creek	U.S.F.S/BLM	25	4 mi. BLM 5 mi. USFS	Trout Fishing	39	
Danville Creek	U.S.F.S./BLM	26	2 mi. BLM 1 mi. USFS	Trout Fishing	191	
Moore Creek	U.S.F.S./BLM	27	6 mi. BLM 1 mi. USFS	Trout Fishing	29	
Mosquito Creek	U.S.F.S./Private/ BLM	28	2 mi. BLM	Trout Fishing	N/A	

PRELIMINARY DRAFT

TABLE II-32
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
Ophir Creek	U.S.F.S/Private/BLM	29	4.5 mi. BLM 5 mi. USFS	Trout Fishing	86	
Peavine Creek	U.S.F.S	30		Trout Fishing	24	
Pine Creek	U.S.F.S./BLM	31	2 mi. BLM 5 mi. USFS	Trout Fishing	126	
Twin River (North)	U.S.F.S	32		Trout Fishing	439	
Twin River (South)	U.S.F.S.	33		Trout Fishing	324	
Off-Road Vehicle Area						
Crecent Sand Dunes	BLM	34		Sand buggies-Sight-seeing	500	
Hunting Areas						
Hot Creek Range	BLM		See Land Use Map	Deer Hunting	600	Access points Big Cow Canyon, Morey Bench
Kawich Range	BLM		See Land Use Map	Deer Hunting	300	Access points Breens Ranch, Longstreets Ranch, Bellhellen Ranch, Eden Creek Ranch
Little Fish Lake Valley c/	BLM		See Land Use Map	Sage Grouse	100	

PRELIMINARY DRAFT

TABLE II- 32
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
Primitive-Back Country Areas						
Morey Peak Primitive Area	BLM	35	14,800	Backpacking-Camping-Nature Study	Unknown	Will be designated in 1978
Six-Mile Back Country Use Area	BLM	36	17,680	Fishing-Camping	Unknown	Will be designated in 1978
Rockhound Areas						
Tonopah Gem Field	BLM	37	2,000	Mineral Collecting	400	Closed to material sales
Pine Nut Gathering Areas						
Hot Creek Mountain Range	BLM		See Vegetation Map-Pinyon Pine	Pinenut Collecting	1,000 Total	Use concentrated in areas shown on Land Use Map
Kawich Mountains	BLM					
Reveille Range	BLM					

a/ Sites and areas included on this table are only those where visitor use estimates are available.
b/ One "Visitor Day" equals 12 visitor-hours of use. This implies that one or more visitors participated in an activity for an aggregate total of 12 hours. Two people using an area for six hours each or 24 people using an area for one-half hour each would constitute one Visitor Day. An "average-length-of-use" factor for each activity would be required to convert Visitor Days to Activity Days or vice versa; but such data were not located.
c/ See Table II- , Hunter Use Data, for detailed information. Complete recreation resource inventory and use analyses located in Tonopah and Esmeralda Unit Resource Analysis files.

Abbreviations used in this table are: USFS, U.S. Forest Service; BLM, Bureau of Land Management; N/A, not available.

SOURCE: BLM, Tonopah Recreation Information System, URA Step 3, 1975.

PRELIMINARY DRAFT

Along with inherent natural beauty of sightseeing areas, these features show very little evidence of man's presence. The absence of structures, management activities, or modification of landscape elements are perhaps the most distinguishing characteristics of the visual resource in the Tonopah study area. Travelers through the area are usually aware that almost no fences parallel the highways and roads, and few intrusions mar the landscape. Exceptions are the wood-pole utility lines along main roads, an occasional mining scar, bladed road, or building. For the most part, though, the undeveloped character of the area dominates any unnatural occurrence in this vast setting. Numerous old ranch buildings, cabins, corrals, and fences can be seen throughout the area. These historic structures and the few occupied ranches and farms serve as reminders of the relative emptiness of the country, and reinforce the image of a part of the West that remains unaffected by urbanization and "progress".

Quality of scenic areas and features enjoyed by recreationists and back-country users and broad panoramas that provide the traveler's impressions and the settings for most daily activities, were evaluated during the URA as part of the Recreation Inventory System. The existing quality of each visual "rating area" was measured and assigned a grade of "A", "B", or "C" with A being the highest relative scenery class. Rating areas were delineated by defining similar basic landscape elements and overall appearances which were then rated according to procedures outlined in Appendix I, Scenery Quality Rating Criteria. A detailed description of the rating process is contained in Bureau of Land Management (BLM) Manual 6310, Visual Resource Inventory and Evaluation. Rating criteria considered topography, water, vegetation, color, and unique features, as well as unpleasant or inharmonious elements, to establish a certain view's overall quality or value as a scenic resource.

PRELIMINARY DRAFT

There may be as many different opinions about the set of visual elements in any given landscape scene as there are viewers. However, an attempt is made to rate the landscape's "sensitivity level", or the measure of importance of a scene to an observer, and his concern for its quality. Sensitivity rating areas are based on types of use, numbers of users, relationships to other uses, and community relationships and attitudes. These basic criteria, along with any additional factors developed to meet special local situations, are assigned numerical weight factors according to their relative importance. This weighting is done by a team of specialists and land managers, and by interpretations of public values through the BLM planning system.

Sensitivity levels, when combined with quality ratings within four visual distance zones -- (1) foreground, (2) middleground, (3) background, and (4) seldom seen -- provide a basis for evaluating appreciation of, or demand for, the visual resource, and for recommending managment objectives. Sensitivity rating procedures are fully explained in BLM Manual 6310, Visual Resource Inventory and Evaluation.

Quality evaluations, sensitivity levels, and visual zones are all combined through a system of maps and transparent overlays to define areas of common relative visual resource values and to assign "visual resource management classes". These class assignments actually determine the amount of change BLM will allow in the characteristic landscape.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Class I is reserved for designated management areas, such as natural areas, primitive areas, or other situations where management activities are to be restricted according to standards established by legislation or policy. Class I areas shown on the Visual Management Classes Map, include Morey Peak proposed primitive area (14,800 acres), and Six Mile Canyon proposed back country area (17,680 acres). Photo Illustration II-11, Northside, Morey Peak, illustrates scenery managed as Class I.

Illustration II-11. Photograph shows Northside, Morey Peak, Class I Visual Management Unit example. Area is within the Morey Peak Proposed Primitive Area, Hot Creek Allotment.

PRELIMINARY DRAFT

Class II applies to areas where changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. Class II areas were delineated according to relatively high sensitivity levels in zones with high use volumes (U.S. Highway 6-95) or with especially good scenic values (Lunar Crater; Grant Range). See photo Illustration II-12, Six Mile Canyon Back Country Area.

Illustration II-12. Photograph shows Six Mile Canyon Back Country Area, Class II Visual Management Unit example.

PRELIMINARY DRAFT

Class III allows changes in the basic elements by management activities, as long as they remain subordinate to the visual strength of the existing character. Little Fish Lake Valley, northern Big Smoky Valley, and southern Stone Cabin Valley are examples of Class III visual management units. (See photo Illustration II-13, Little Fish Lake Valley, for example of Class III.)

Illustration II-13. Little Fish Lake Valley, Class III Visual Management Unit example.

Management activities in Class IV areas may subordinate the original composition and character of the view, but must reflect what could be natural occurrences within the characteristic landscape. Photo Illustration II-14 , Reveille Valley, illustrates typical scenery placed in the Class IV category.

Illustration II-14. Reveille Valley, Class IV Visual Management Unit example.

PRELIMINARY DRAFT

Class V applies to areas where the naturalistic character has been disturbed to a point where rehabilitation is needed to bring it into character with the surrounding countryside. The scenery quality evaluation in BLM's URA identifies areas where the visual quality has been reduced by disturbances or inharmonious intrusions, and would require some form of enhancement or rehabilitation to restore it to a higher visual resource management class. No Class V areas were designated in the study area, since management decisions tend to provide for intensive application of protective measure to scenic areas and cultural or natural sightseeing features, rather than rehabilitation of man-caused disturbances. (Tonopah MFP, 1976.)

PRELIMINARY DRAFT

Cultural Resources

Human Use and Occupation

Because little is known about the archaeology of the Great Basin, this narrative is a synthesis of current knowledge of the area, subject to change as new information and comparative data are accumulated.

It appears that the earliest identifiable cultural remains in the Great Basin are associated with the Fluted Point Tradition, represented by the occurrence of fluted points (see Glossary) characteristic of Clovis, Llano, and Folsom complexes dated to circa (ca.) 8,000-10,000 B.C. Characteristic of the complexes are tools which represent big game hunting in the Great Plains. These projectile points have been noted near Tonopah, on the beaches of extinct Lake Tonopah and in the Mud Lake - Lowengruhn Beach areas. (Tuohy, Great Basin Archaeology, 1974; Symposium of Southwest, 1968; "Technological Linkage," 1969; Campbell, "Two Ancient Archaeological Sites," 1949; Davis, Shutler, "Discoveries of Fluted Points", 1969). The Western Pluvial Lakes Tradition includes many of the early lithic (stone) assemblages associated with the shorelines of ancient lake systems. These lacustrine or lake-oriented sites of early time span ca. 9000 B.C. and 6000 B.C. include the Lake Tonopah localities. The Great Basin Archaic,

PRELIMINARY DRAFT

covering the period between 5000/6000 B.C. to A.D. 500/900, represented both desert and lacustrine adaptations while also utilizing other resources such as those provided by mountainous environments. The Rose Spring/Eastgate Period, during which the bow and arrow were introduced, is dated roughly A.D. 500-1000. The Prehistoric Period, beginning at about A.D. 1000 or later, is characterized by the introduction of brownware ceramics and marked the advent of Paiute and Shoshonean peoples, ancestors of the tribes found in the Great Basin at the time of historic contact. Various phases in the Reese River and Monitor Valleys to the north of the study area represent the Great Basin Archaic, Rose Spring-Eastgate, and Late Prehistoric Periods. Information from these areas may provide background and indications of the prehistory of these valleys as they extend into the study area.

Northern Paiute and Shoshone occupied the study area: Ione Valley's western border--the Paradise Range--was the tribal boundary. There are indications of horticulture, unusual for Great Basin Indians, in the Ione Valley. Villages and camps existed in the Reese River Valley, Big Smoky Valley, Monitor Valley, Hot Creek Valley, and Railroad Valley. The lifestyle included food gathering, communal antelope and rabbit hunts, and congregation at regional villages for festivals (Steward, Basin-Plateau Aboriginal Groups, 1938).

The early period of white man contact was characterized by exploration and penetration of the territory by trappers. Jedediah Smith was

PRELIMINARY DRAFT

the first white man to cross central Nevada on his 1826 exploration; his exact route is not known. John C. Fremont passed through the Big Smoky Valley, along the Toiyabe Range, and stopped to camp at Darrough Hot Springs during his 1845 expedition. Discovery of tremendous mineral resources brought prospectors who penetrated the most remote areas of the territory, and boomtowns sprang up. Shoshone, who previously had limited contact with the white man, congregated at many of these towns. To provide food for the mining camps, herds of cattle were brought into the area, and many of the valleys supported sheep and cattle grazing. Warfare broke out between the Indians and the white man, who decimated the native food plants by livestock grazing and by cutting pinyon nut trees for fuel (Steward, Basin-Plateau Aboriginal Groups, 1938). Since 1870, the Shoshone have been dislodged from their native habitat, with some Shoshone and Paiute working for the white man, some living off the land as before, and many moving to reservations. Other attached themselves to ranches and towns in small groups or colonies.

The inception of Nye County in 1864 was a result of development of the Union mining district in Central Nevada. By the mid-1860's settlements extended from the western reaches at Ione, eastward to Belmont, Hot Creek, and Reveille. Most of the towns were empty and the mines shutdown by the end of the decade because of developments in White Pine County. The 1870's were highlighted by production at Belmont, Jefferson, Tybo, and Grantsville, with many smaller mines active in northern Nye County. After 1881, mining in the area was depressed for the rest of the century.

PRELIMINARY DRAFT

The discovery of silver at Tonopah in 1900 resulted in a series of mining rushes during which the whole area was prospected. Dozens of camps arose. Mining continued in various locations throughout the early 1940's, and after World War II, large operations resumed at Manhattan and Round Mountain. Smaller mines are also active today.

The Battle Mountain grazing district was created in 1951, and livestock grazing has remained a part of the local economy.

Identification and Inventory

Cultural resources are defined as those fragile, non-renewable remains of human activity, occupation, and endeavor reflected in districts, sites, structures, artifacts, objects, ruins, works of art, architecture, and natural features that were of importance in human events, or documentation. Cultural resources are commonly discussed in terms of their prehistorical and historical value; however, each portion of the resource represents a part of a continuum of events representing the earliest evidences of man to the present day. (Bureau of Land Management (BLM) information memorandum NSO 76-59.)

Those cultural resources which have been identified in the Tonopah study area are aboriginal sites, non-aboriginal sites, and those sites which exhibit manifestations of both cultures. (See Glossary for definitions of aboriginal and non-aboriginal.) Depending upon techniques for study and time of occupancy, these sites would be considered as archaeological, historical, or contemporary

PRELIMINARY DRAFT

resources. The word "site" is used to indicate the physical location where human activities or events transpired: the location of an event, activity, building structure, or object.

The identification of the cultural resources within the study area involved several levels of inventory (or survey) devised for the location and evaluation of the range of cultural resources that occur or may be expected to occur in a given area. Specific procedures employed were:

Class 1 (Existing Data Review): inventory based on search of all pertinent and reasonably available documents and sources which may contain information on the cultural resources of a given area. (See bibliography.) The search included:

(1) Literature search of historical, archaeological, ethnographic, and other related sources,

(2) Search of the Nevada State Museum archaeological site files,

(3) Search of the University of Nevada, Las Vegas Museum of Natural History site files,

(4) Review of BLM Battle Mountain District and Las Vegas District cultural resources inventory files, and

(5) Consultations with individuals.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Class 2 (Reconnaissance Survey): an on-the-ground assessment of cultural resources, based on sampling techniques, to provide data on significant cultural resources without examining all or nearly all areas of the ground. The study included:

A field inventory as designed by the archaeologist, Battle Mountain District Office. (Refer to Cultural Resources Report 6-46(P) on file at the BLM Battle Mountain District Office, and the Nevada State Office).

The cultural resources of the study area are not well-known. A substantial amount of information was available through field survey and excavations in the Reese River and Monitor Valleys, to the north of the Tonopah resource area (D.H. Thomas, "Shoshonean Bands," 1974; "Great Basin Settlement", 1973; "Patterns at Reese River," 1971). While data derived is not directly applicable to the study area, it may provide background for the total central Nevada area as well as providing comparative data. A small number of aboriginal sites were recorded throughout this century by various individuals; non-aboriginal sites were documented in the historical literature. Both aboriginal and non-aboriginal sites were documented in the BLM cultural resources inventory system. (All BLM cultural resources reports and site reports are available at the respective district offices.) This information did not provide data for a large part of the study area. Thus, a cultural resources inventory was designed and implemented in the summer of 1976 by the Battle Mountain

PRELIMINARY DRAFT

District Office in order to obtain additional cultural resources information which would be environmental statement (ES) input. This inventory involved a proposed survey of 100 percent of the springs in the Tonopah Resource Area. This strategy was chosen because of the high probability of both extensive impact by livestock grazing and the existence of cultural resources at springs, the high possibility of development or redevelopment of springs, and the feasibility of such a survey. The cultural resources appendix, Appendix J, contains a statement of the objectives and methodology of the inventory research design. Other than this inventory of springs, no survey has been performed on any project of the proposed Allotment Management Plans (AMPs). A total of 5,999 acres has been surveyed to date, representing less than one percent of the total study area. (See the Cultural Resources Inventory Map.)

PRELIMINARY DRAFT

CULTURAL RESOURCES INVENTORY

MAP

Areas surveyed under Class 2 (extensive) and Class 3 (intensive) are shown.

PRELIMINARY DRAFT

Evaluation

BLM considers all cultural resources found on NRL or adjacent to NRL as important and as meriting consideration. However, not all cultural resources are of equal value, nor do they all merit National Register listing. In order to assess relative importance for management purposes and to identify those properties that should be nominated to the National Register, a Cultural Resources Evaluation System (CRES) has been implemented for Nevada (BLM instruction memorandum NSO 76-120). The system is used in conjuction with and as a part of the BLM's cultural resources inventory process. This memorandum is available upon request. Explicit within this system is the recognition that evaluation of cultural resources through assignment of a particular rating is essentially a subjective process and consequently requires professional judgment.

The following criteria were established as guidelines for the assignment of a particular rating:

Archaeological resources were rated according to depth, architectural features, artistic features, size, antiquity,

PRELIMINARY DRAFT

permanency, uniqueness, representativeness, association, and condition.

Historical resources and contemporary resources were evaluated against criteria established in 36 Code of Federal Regulations 800.10.

During evaluation, sites were given one of the following rating codes:

Level S1 - National Register significance
Level S2 - Mid-significance
Level S3 - Low significance
Level S4 - Data property
Level SO - Other or not rated

Full explanation of these rating codes and their management implications is contained in Nevada BLM instruction memorandum NSO 76-120, available by writing State Director (N-911), Bureau of Land Management, Room 3008 Federal Building, 300 Booth Street, Reno, Nevada 89509.

Summary of Known Cultural Resources

To date, there are 317 cultural resource sites identified in the Tonopah study area, including NRL, national forest land, and private land. Of these, four are listed on the National Register (Federal Register, Vol. 41, No. 194, and monthly supplements through October 5, 1976): Tybo Charcoal Kilns (NRL), James Wild Horse Trap (NRL),

PRELIMINARY DRAFT

Belmont (multiple ownership) and Berlin (Nevada State Park System). Five sites (1.6 percent) are rated S-1 and thus considered National Register eligible. These are the townsite of Ione (CrNV-06-348), Mountain View (CrNV-06-330), Mountain View Arrastra (CrNV-06-323), Moore's Station Petroglyphs (Ar 27-06-94), and Jumbled Rock Gulch Petroglyphs (Ar 27-06-95). A total of 28 sites (8.8 percent) are rated S-2, 27 (8.6 percent) are rated S-3, and 253 (80.0 percent) are rated S-0.

Table II-33, Summary Cultural Resources, lists the known cultural resources of the study area, location by proposed allotment, rating and attributes. The Cultural Resources Map indicates known cultural resources based on completed inventory. All cultural resources are on NRL or national forest lands managed by the BLM except as otherwise noted. Void areas do not necessarily represent a lack of cultural values, but indicate where surveys are lacking (see Cultural Resources Inventory Map).

Table II-34, Site Types, describes the nature of these resources by reference to site functions and physical attributes. Many of the sites are of an undetermined type due to the need for further data necessary for assessment, as reflected in the large number of SO rated sites.

PRELIMINARY DRAFT

Nelson (multiple Wheeler) and Berlin (Nevada State Park System).
Five sites (1.6 percent) are rated S-1 and thus considered National
Register eligible. These are the townsite of Ione (CrNV-06-318),
Mountain View (CrNV-06-330), Mountain View Arrastre (CrNV-06-323),
Moore's Station Petroglyphs (Ax 27-06-01), and Indian Rock Guich
Petroglyphs (Ax 27-06-02). A total of 78 sites (8.8 percent)
are rated S-2, 27 (8.6 percent) are rated S-3, and 255 (80.0 per-
cent) are rated S-4.

Table II-33, Summary Cultural Resources, lists the known cultural
resources of the study area, location by proposed alternative, rating
and attributes. The Cultural Resource Map indicates known cultural
resources based on comprised inventory. All cultural resources are
on BLM or national forest lands managed by the BLM except as otherwise
noted. Void areas do not necessarily represent a lack of cultural
values, but indicate where surveys are lacking (see Cultural Resource
Inventory Map).

Table II-34, Site Types, describes the nature of these resources by
reference to site functions and physical attributes. Many of the
sites are of an undetermined type due to the need for further data
necessary for assessment, as reflected in the large number of S3 rated
sites.

PRELIMINARY DRAFT

KNOWN CULTURAL RESOURCES

MAP

Areas of archaeological, historical and contemporary resources are shown.

TABLE II-33
SUMMARY OF KNOWN CULTURAL RESOURCES

Proposed Allotment	No. Sites	Rating	Type/Condition	Aboriginal	Non-Aboriginal
BLUE EAGLE	4	S0	Small campsite; extensive open sites in dunes, near springs. Disturbance includes natural erosion, cattle trampling, roads, vandalism.	x	x
	1	S0	Contemporary resource: Eagle Spring oil field.		x
Total Sites:	5				
BUTTERFIELD	6	S2	Open, extensive sites, pictographs, caves and rock shelters. Disturbance includes natural erosion, roads, camping, livestock trampling, animal burrowing, and vandalism.	x	
	1	S3	Open site with historic features.	x	x
	3	S3	Open sites near springs with moderate to sparse scatter, and possible rock shelters. Disturbance includes natural erosion.	x	
	2	S0	Mining camps with stone buildings remaining.		x
	1	S0	Open habitation site with historic stone cabins and mining structures. Disturbance includes road-grading, mining activities, and vandalism.	x	x
	11	S0	Small open sites with medium to sparse scatter, near springs. Disturbance includes cattle trampling, roads, spring development, natural erosion, powerline activities, and bulldozing.	x	
Total Sites:	24				
NYALA	1	S3	Small open site near springs. No disturbance documented.	x	
	1	S0	Stone buildings at spring, in good condition. History unknown.		x
	1	S0	Open site with sparse scatter around springs and historic dugout nearby. Disturbance includes roads and cattle trampling.	x	x
	1	S0	Stone corrals. Condition unknown.		x
	15	S0	Extensive open and dune sites with moderate scatter, smaller sites with sparse scatter, and horse trap - antelope run, all near springs. Disturbance includes cattle trampling, roads, fences, natural erosion, vandalism, spring development, and bulldozer cuts.	x	
Total Sites:	19				

PRELIMINARY DRAFT

TABLE II-
SUMMARY OF KNOWN CULTURAL RESOURCES

Proposed Allotment	No. Sites	Rating	Type/Condition	Aboriginal	Non-Aboriginal
REVEILLE	1	S3	Early stopover for travelers, teams, livestock. Little remains of historic past. Present occupation. b/		x
	2	S3	Open sites with sparse scatter, near springs. No disturbance documented.	x	
	5	S0	Mining camps, townsites and mills c/; early homesteading ranch b/. Stone adobe foundations and mining workings still remain.		x
	3	S0	Rock shelters with pottery, lithics, and historic debris nearby; open sites with historic structures. Disturbance includes buildings, dams, roads, fences, bulldozing and water run-off.	x	x
	5	S0	Open sites with moderate to sparse scatter, various extents, near springs. Disturbance includes roads, horse and cattle trampling, use as sheep camp, natural erosion	x	
Total Sites:	16				
HOT CREEK	1	NR a/	Charcoal kilns. Good condition with minor natural deterioration.		X
	1	S1	Arrastra. Rare and in good condition.		x
	4	S2	Open site, petroglyphs, and rock shelters. Disturbance includes cattle trampling.	x	
	3	S2	Archaeological Shoshone camps of historical period. Uncommon and undisturbed.	x	
	6	S2	Charcoal kilns, stage station b/, and log cabin (uncommon). No disturbance documented.		x
	7	S3	Charcoal kilns, mining townsite c/, cabins, foundations, and debris. No disturbance documented. Cabins poorly preserved.		x
	1	S3	Small open site with historic component. No disturbance documented.	x	x
	2	S3	Small open sites near springs and washes. Disturbed by roads.	x	
	31	S0	Shelters, open sites, pictographs, and quarry; of various extents and scatter densities, mostly near springs. Disturbance includes vandalism, previous spring developments, roads, natural erosion, cattle trampling, and rodents.	x	

PRELIMINARY DRAFT

TABLE II-33
SUMMARY OF KNOWN CULTURAL RESOURCES

Proposed Allotment	No. Sites	Rating	Type/Condition	Aboriginal	Non-Aboriginal
Hot Creek (cont.)	8	SO	Stone corrals, charcoal kilns, mining camps and townsites c/, stage station b/, cabins, and road. Road erased by spring development and pipeline. Structures still remain at other sites.		x
	7	SO	Open sites with mining debris, cabins, and rock structures. Disturbance includes natural erosion roads, pipeline, and campers.	x	x
Total Sites:	71				
WAGON JOHNNIE	1	NR a/	Wild horse trap. Good condition and unique. Pipeline constructed before National Register nomination.		x
	2	SO	19th-century ranch with stone structures and sod rooves still standing in fair condition b/; mining camp with a few wooden structures remaining.		x
	27	SO	Campsites in washes and isolated finds. Initial disturbance included natural erosion, previous spring development, and historical activity. Sites were avoided by chaining in surrounding area.	x	
Total Sites:	30				
STONE CABIN	4	S2	Rock shelters in tuff outcrops, one with rock features and rat midden near springs. Undisturbed. Open site on ridge top, near spring. Disturbance includes fence, road, and livestock trampling.	x	
	3	S2	Charcoal kilns. Good condition.		x
	1	S3	Open site with sparse scatter and historic component of mining activity. Disturbance includes roads, bulldozer cuts, and horse trampling.	x	x
	2	S3	Small rockshelter in tuff outcrop near spring; shallow deposit. Small open site. No disturbance documented.	x	
	1	SO	Open site with sparse scatter and charcoal kilns; open site with historic walls and cabin foundation. Disturbance includes roads, cattle trampling, vandalism, spring development, natural erosion, wild horse trampling, bulldozer cuts, and pipeline.	x	x
	5	SO	Mining townsites with structures remaining, 19th-century ranch with stone and adobe structures still standing. b/		x
Total Sites:	30				

PRELIMINARY DRAFT

II-194

TABLE II-
SUMMARY OF KNOWN CULTURAL RESOURCES

Proposed Allotment	No. Sites	Rating	Type/Condition	Aboriginal	Non-Aboriginal
RALSTON-MONITOR	1	NR a/	Mining townsite, local government. Present occupation. Structures remain. c/		x
	1	S3	Small open site near spring. Highly disturbed by aqueduct installation.	x	
	1	S3	Historic cabin near springs. Common. No disturbance documented.		x
	9	S0	Open sites with sparse to moderate scatter, near water sources or along lake terraces. Disturbance includes cattle trampling, vandalism, erosion, roads, mining, and spring development.	x	
	18	S0	Lake bed and terrace sites with early man components. Some collection.	x	
	2	S0	Open sites with lithic scatter and historic features, near springs. Disturbance includes attempt at spring development, vandalism, some erosion, and cattle trampling.	x	x
	7	S0	Mining camps and townsites, and stage stations c/. Structures and prospect holes remain.		x
	2	S0	Comtemporary resources: Tonopah underground aqueduct and Tonopah Army Air Field.		x
Total Sites:	41				
HUNTS CANYON	5	S0	Extensive open sites and rock shelters. Disturbance includes cattle trampling, spring development, and vandalism.	x	
	1	S0	Wildcat townsite. Few foundations remain.		x
Total Sites:	6				
FRANCISCO	1	S2	Open campsite. Gravel pit at site location.	x	
Total Sites:	1				
DARROUGH HOT SPRINGS	1	S0	Extensive open site on lake terrace. Most of the site has been bulldozed.	x	
	1	S0	Stage station and hot springs. All structures in excellent condition. b/		x
Total Sites:	2				

PRELIMINARY DRAFT

II-195

TABLE II-
SUMMARY OF KNOWN CULTURAL RESOURCES

Proposed Allotment	No. Sites	Rating	Type/Condition	Aboriginal	Non-Aboriginal
IONE	1	NR a/	Mining townsite with present occupation. Good condition. d/		x
	1	S1	Mining townsite with present occupation. Good condition.		x
	1	S2	Small cave in rhyolite cliff. Numerous pot holes and mining prospect. Unique for the area.	x	
	1	S2	Arrastra. Uncommon and in fair condition with some miscellaneous debris.		x
	1	S3	Open site near spring with historic structures. No disturbance documented.	x	x
	1	S3	Mining site with dugout, mill ruins, and collapsed dwellings. No disturance documented.		x
	4	S0	Open sites of unassessed extent and depth, and hunting blinds. Disturbance includes road cute, cattle trails, and erosion.	x	
	3	S0	Mining camps and cyanide mill. Some frameworks remain.		x
Total Sites:	13				
SAN ANTONE-SMOKY					
	9	S0	Campsite with pottery and extensive open sites of unassessed depth; near springs or dunes or lake terraces. Disturbance includes livestock trampling, vandalism, roads, and water developments, hunters, and natural erosion.	x	
	27	S0	Lake bed and terrace sites with early man components. Some collection.	x	
	10	S0	Stage station b/, mining camps and townsites c/. Structures remain at some locations.		x
	2	S0	Open sites with historical components, located at springs. Disturbance includes spring development, roads, and extensive cattle trampling.	x	x
Total Sites:	50				
WILLOW CREEK	3	S0	Open campsites. Some disturbance.	x	
Total Sites:	3				

PRELIMINARY DRAFT

TABLE II-33
SUMMARY OF KNOWN CULTURAL RESOURCES

Proposed Allotment	No. Sites	Rating	Type/Condition	Aboriginal	Non-Aboriginal
MULTIPLE ALLOTMENTS	1	SO	Contemporary resource: Atomic Energy Commission Central Nevada Supplemental Test Area and Energy Research and Development Administration Facilities.		x
	1	SO	Tonopah-Goldfield railroad grade. Grade only remains.		x
	3	SO	Jedediah Smith trail; no physical remains identified to date. John C. Fremont trail; no physical remains identified to date. Midland trail; physical remains unassessed.		x
	1	SO	Contemporary resource: Tybo to Belmont powerline. Portions of the powerline poles remain.		x
Total Sites:	6				

TOTAL SITES - STUDY AREA: 317

a/ Cultural resources currently listed on National Register of Historic Places.
b/ Cultural resources located on private land, including patented mining lands.
c/ Cultural resources involving multiple ownership, public and/or private.
d/ Cultural resources owned and managed by Nevada State Park System.

PRELIMINARY DRAFT

II-197

TABLE II-34
SITE TYPES

Allotment	"Earlyman"	Campsite	Chipping Station/ Lithic Scatter	Quarry/ Lithic Workshop	Rockshelter	Pitcographs/ Petroglyphs	Trails	Contemporary Resources	Aboriginal Structure	Non-aboriginal Structure	Undetermined a/	Other
Blue Eagle		4						1				
Butterfield		9	7	2	3	2			0	3	3	0
Nyala		8	6	0	1				1	3	1	0
Reveille		3	4	1	1	0			0	9	4	0
Hot Creek		15	19	2	5	4			1	30	8	0
Wagon Johnnie		11	16							3	0	0
Stone Cabin		5	8	1	5	0			1	1	5	0
Ralston-Monitor	18	3	3	1	2			2	0	11	2	1
Hunts Canyon		4	1							1	0	0
Francisco		1										
Darrough Hot Spring		1								1		
Ione		1	1	0	2	0			1	7	3	0
San Antone-Smoky	26	7	2	0	1				0	13	2	0
Willow Creek		3										
Multiple		3					3	3		2		
Total	44	75	67	7	20	6	3	6	4	84	28	1
% Total Sites b/	13.9	23.7	21.1	2.3	6.3	1.9	.9	1.9	1.3	26.5	8.8	0.3

a/ All open sites of unassessed parameters and depth.
b/ Some sites involve more than one site type.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Due to the nature of the ES survey design, which inventoried 168 springs, a minimum of 156 sites are located in the vicinity of live or extinct springs.

Table II-35, Disturbance Factors, indicates those factors which are presently causing deterioration of the resource base. Three percent of the known cultural resources have experienced minimal disturbance, classified as undisturbed. Forty-five percent have no documented information as to whether or not disturbance has occurred. Historical townsites, stations and ranches comprise the bulk of this category. Seventeen percent of the cultural resources have been affected by the construction, creation and use of roads, including bulldozer damage; 15 percent have been disturbed by project activities; and 13 percent have been affected by cattle trampling. (See Table II-35 for further information.)

PRELIMINARY DRAFT

TABLE II-35

DISTURBANCE FACTORS

Allotment	Cattle Trampling	Horse Trampling	Vandalism	Erosion a/	Natural Erosion	Road Construction and Use	Project Activities	Land Treatment	Mining Activities	Historic Activities	Hunters/ Campers	Animal Burrowing	Undisturbed	Disturbance not Documented
Blue Eagle	2			3		2	1							2
Butterfield	4		4	3	1	10	4		1		1	1		5
Nyala	10		2	3	3	7	5							3
Reveille	2	2		3	1	5	4				1		1	9
Hot Creek	5	1	2	3	5	16	11		1		2	1	5	31
Wagon Johnnie				4	3		5	24 b/		1	1			3
Stone Cabin	6	3	2	2	3	7	6				1		3	8
Ralston-Monitor	3		1	2	1	1	2			1	1			30
Hunts Canyon	2		1				1							3
Francisco							1							
Darrough Hot Springs	1									1				1
Ione	1		1	1		1	3		1	1				5
San Antone-Smoky	5		1	2	1	6	4				1			41
Willow Creek							1							3
Total	41	6	14	26	18	55	48	24 b/	3	4	8	2	9	144
% Total Sites a/	12.9%	1.9%	4.4%	8.2%	5.7%	17.4%	15.1%	7.6%	0.9%	1.3%	2.5%	.6%	2.8%	45.4%

a/ Erosion not specified as to cause.

b/ The sites concerned were within proposed chaining area. Prior to actual chaining, some were partially collected and others were flagged and avoided. The subsequent chaining has disturbed the, environmental and ecologically-associated data. See Cultural Resources report 6-3 (P).

c/ Some sites are affected by more than one factor.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

As a part of cultural resource management, various sites have been scheduled for protective measures through an MFP. Table II-36 lists the cultural resources and the scheduled protective measures. This table reflects the existing management situation and forms the basis for the consideration of impacts and mitigating measures of the proposed action.

PRELIMINARY DRAFT

Version 1 With Names

TABLE II-36

PROTECTIVE MEASURES - MFP DECISIONS

Cultural Resource	Number	Protective Measure
Atwood	CrNV-06-349	Withdraw if necessary to protect, or salvage historical objects.
Cimarron Mine	CrNV-06-357	Work with mining claim owners to preserve historical objects; if not possible, salvage arrastra.
Longstreets Ranch	Hs27-06-2	Obtain necessary easements. Designate scenic buffer zone (sections specified in MFP). Require wood harvest in area to comply with forest product cutting plan.
Tybo	CrNV-06-331	
Morey	CrNV-06-315	
Moore's Station	CrNV-06-316	
Pritchard's Station	CrNV-06-315	
Hot Creek	CrNV-06-324	
Silverbow	CrNV-06-339	Intensive development of McIntyre Kiln site as experimental development. Create one-mile radius scenic buffer zone around sites.
Reveille	CrNV-06-344	
Six-Mile Charcoal Kilns	CrNV-06-318	
	CrNV-06-319	
	CrNV-06-320	
	CrNV-06-321	
Ox Springs Canyon	CrNV-06-347	
McIntyre Charcoal Kilns	CrNV-06-327	
	CrNV-06-328	
	CrNV-06-329	
Mountain View	CrNV-06-330	Intensive development for recreation use and protection. Consider withdrawal from mineral entry. Nominate to National Register of Historic Places.
	CrNV-06-323	
Tybo Charcoal Kilns	Hs27-06-8	Scenic buffer zone one-half mile radius around each site. Withdraw 60 acres at Tybo Charcoal Kilns and 80 acres around James Wild Horse Trap from mineral entry.
James Wild Horse Trap	Hs27-06-7	

PRELIMINARY DRAFT

TABLE II-36

PROTECTIVE MEASURES - MFP DECISIONS

Cultural Resource	Number	Protective Measure
Moore's Station Petroglyphs Jumbled Rock Gulch Petroglyphs	Ar27-06-94 Ar27-06-95	Designate one-half mile radius scenic buffer zone. Nominate each site to National Register. Withdraw 40 acres at each site from mineral entry.
No name	CrNV-06-402	Within proposed Primitive Area. After mineral investigation, withdraw from mineral entry. Close to mechanical travel and livestock grazing.
Charcoal Kilns and open archaeological sites	CrNV-06-301 CrNV-06-303 CrNV-06-304 CrNV-06-305 CrNV-06-306 CrNV-06-307 CrNV-06-308 CrNV-06-318 CrNV-06-319 CrNV-06-320 CrNV-06-321 CrNV-06-373	Within proposed "back country use area." Close to livestock grazing.

PRELIMINARY DRAFT

Version 2

Without Names

TABLE II-36

PROTECTIVE MEASURES - MFP DECISIONS

Number	Protective Measure
CrNV-06-349	Withdraw if necessary to protect, or salvage historical objects.
CrNV-06-357	Work with mining claim owners to preserve historical objects; if not possible, salvage arrastra.
Hs27-06-2 CrNV-06-331 CrNV-06-315 CrNV-06-316 CrNV-06-315 CrNV-06-324	Obtain necessary easements. Designate scenic buffer zone (sections specified in MFP). Require wood harvest in area to comply with forest product cutting plan.
CrNV-06-339 CrNV-06-344 CrNV-06-318 CrNV-06-319 CrNV-06-320 CrNV-06-321 CrNV-06-347 CrNV-06-327 CrNV-06-328 CrNV-06-329	Intensive development of McIntyre Kiln site as experimental development. Create one-mile radius scenic buffer zone around sites.
CrNV-06-330 CrNV-06-323	Intensive development for recreation use and protection. Consider withdrawal from mineral entry. Nominate to National Register of Historic Places.
Hs27-06-8 Hs27-06-7	Scenic buffer zone one-half mile radius around each site. Withdraw 60 acres at Tybo Charcoal Kilns and 80 acres around James Wild Horse Trap from mineral entry.

PRELIMINARY DRAFT

II-204

TABLE II-36

PROTECTIVE MEASURES - MFP DECISIONS

Number	Protective Measure
Ar27-06-94 Ar27-06-95	Designate one-half mile radius scenic buffer zone. Nominate each site to National Register. Withdraw 40 acres at each site from mineral entry.
CrNV-06-402	Within proposed Primitive Area. After mineral investigation, withdraw from mineral entry. Close to mechanical travel and livestock grazing.
CrNV-06-301 CrNV-06-303 CrNV-06-304 CrNV-06-305 CrNV-06-306 CrNV-06-307 CrNV-06-308 CrNV-06-318 CrNV-06-319 CrNV-06-320 CrNV-06-321 CrNV-06-373	Within proposed "back country use area." Close to livestock grazing.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Probability of Unknown Cultural Resources

As a part of the research design developed by the Battle Mountain District Office to obtain inventory data on the study area within the Tonopah resource area, probabilities of occurrence of cultural resources were developed using BLM data on vegetative types, degree of slope, and presence of springs and/or other permanent surface water. Supplementary data were U.S. Geological Survey maps. The probability categories were defined as follows and delineated on overlays:

Very high: Presence of surface water; any vegetative type or slope gradient.

High: near surface water; vegetative types of pinyon-juniper, sage species, or grass; slope of less than 30 percent. Any area within one mile of surface water is listed as high regardless of slope or vegetation.

Medium: same as above, but not near surface water (vegetative types of pinyon-juniper, sage species, or grass and slope less than 30 percent).

Low: other vegetative types not near surface water or slope over 30 percent.

Probability criteria for Esmeralda County included extinct surface waters as a high probability area, in addition to the above criteria.

PRELIMINARY DRAFT

Probability of Unknown Cultural Resources

As a part of the research design developed by the Battle Mountain District Office to obtain inventory data on the study area within the Tenopah resource area, probabilities of occurrence of cultural resources were developed using BLM data on vegetative types, degree of slope, and presence of springs and/or other permanent surface water. Supplementary data were U.S. Geological Survey maps. The probability categories were defined as follows and delineated on overlays:

Very high: Presence of surface water; any vegetative type or slope gradient.

High: Near surface water; vegetative types of pinyon-juniper, sage species, or grass; slope of less than 30 percent.

Any area within one mile of surface water is listed as high regardless of slope or vegetation.

Medium: Same as above, but not near surface water (vegetative types of pinyon-juniper, sage species, or grass and slope less than 30 percent).

Low: Other vegetative types not near surface water or slope over 30 percent.

Probability criteria for Esmeralda County included extinct surface waters as a high probability area, in addition to the above criteria.

PRELIMINARY DRAFT

As more inventory information is gathered and the criteria for defining the probability categories are substantiated, refuted, or modified, the overlay delineations will reflect this additional data. (These overlays are on file at BLM's Battle Mountain District Office). Identification of known cultural resources is based on inventory of less than one percent of the total study area. Considering this small amount of inventoried acreage on which to base the probability of cultural resources, the above categories are a quantification of unknown cultural resources and are not indicative of the quality of those resources.

For additional information, Appendix J contains a statement of the inventory research design. The Cultural Resources Map indicates the probability areas. Cultural Resources Report 5-46(P) concerns the Battle Mountain District Office Tonopah ES Inventory, and is available at the district office.

PRELIMINARY DRAFT

CULTURAL RESOURCES PROBABILITY MAP

Areas of very high, high, medium, and low probability of unknown cultural resources are shown.

PRELIMINARY DRAFT

Paleontological Resources

The paleontological resources located on the national resource lands of the Tonopah study area include: invertebrates (such as the late Paleozoic shells of the Pancake Range), mammalian fauna (such as in the San Antonio Mountains) and other vertebrates, trace fossils, and plant fossils.

PRELIMINARY DRAFT

Land Use

Controls and Constraints

Ranchers had free and unlimited use of unreserved, unappropriated public lands, now called national resource lands (NRL), until the Taylor Grazing Act of 1934. The primary purpose of that act was to stop continuing injury to the public rangelands through overgrazing. In addition, the Act states that tenure to public lands cannot be acquired through preemptive means prior to classification of the land for the intended purpose by the Secretary of the Interior. The lands remain open, however, for the staking of mining claims and for public hunting, fishing, camping, and other outdoor recreation purposes.

Congress enacted the Classification and Multiple-Use Act (Public Law 88-607) on September 19, 1964. This Act authorizes and directs the Secretary of the Interior to classify national resource lands (NRL) for disposal or for retention for management under principles of multiple-use sustained yield of products and services. In 1970 all unappropriated NRL was classified for retention for multiple-use management. This classification segregates all of the involved lands from appropriation under the agricultural land laws (43 U.S.C. Chapters 7 and 9; 25 U.S.C. 334) and from public sale under Section 2455 of the Revised Statutes (43 U.S.C. 1171). The lands remain open to all other applicable forms of appropriation, including the general mining and mineral leasing laws. The segregation was imposed because of the relatively poor cropland potential of the land. This low potential makes it uneconomical to develop 320-acre agricultural units, the size authorized

under the Desert Land Entry Act. There are 293,247 acres in the study area that remain unclassified. These lands were withdrawn from multiple-use for livestock driveways during the time when NRL was being classified under the Classification and Multiple Use Act. The withdrawal has since been restored, but the lands have never been reclassified for multiple-use.

The National Environmental Policy Act of 1969, or NEPA (Public Law 91-190); Executive Order 11514(35F.R.4247) enacted on March 5, 1970; guidelines by the Council on Environmental Quality (36F.R.1389) of January 28, 1971; and Bureau of Land Management (BLM) Manuals 1791, 1792, and 2031, provide the authority, directives, and guidelines for enhancing and protecting the quality of the environment. These environmental concepts, along with multiple-use management guidelines and policies, are the primary controls and constraints affecting Federal lands in the study area.

Lands segregated from mineral entry and appropriation under all land laws except the Recreation and Public Purposes Act include Lunar Crater, (acres), Morey Bench Test Plat, (acres), and Morey Bench Exclosure (acres). Recreation and public purpose withdrawals protect a proposed 40 acre community rodeo grounds and trap shooting range in Big Smoky Valley, a 400-acre buffer zone adjacent to Berlin-Icthyosaur State Park, and a 15-acre hospital site in Tonopah.

In the 1960's, the Energy Research and Development Administration (formerly the Atomic Energy Commission) conducted underground nuclear tests on three withdrawn parcels in Hot Creek Valley totaling 2,560 acres. There is no current activity at the sites, but the withdrawals remain in effect for monitoring and research, and to protect expensive improvements.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

The U.S. Fish and Wildlife Service withdrew 14,720 acres in northern Railroad Valley as wildlife management areas. The four waterfowl habitat areas are now managed cooperatively by BLM and the Nevada Department of Fish and Game. Livestock driveway withdrawals in Ione Valley total 24,080 acres.

Nye County recently adopted a comprehensive land use plan, but since no serious use conflicts have been identified, the county has not used its authority to impose zoning restrictions on non-Federal land. Esmeralda County adopted Ordinance No. 120 in 1970, which provides for land use planning and zoning for the entire county, excluding established communities. Esmeralda County included the Public Land Sale Act of 1964 (78 Stat. 988, 43 U.S.C. 1421-27) as part of its regional zoning ordinance to prevent the sale of NRL without the application of the Act.

Private lands within the study area total about 55,320 acres. Patented mining claims make up the bulk of the 4,160 acres around Tonopah and Round Mountain. The communities of Ione and Manhattan presently occupy NRL. Townsite applications will allow BLM to transfer land ownership to Ione and Manhattan.

About 460 acres are actually in urban use. Urban population density at present is six people per acre; or about 100 per square mile, based on a total urban population of 1,992. The remainder of the area's residents live in small rural settlements or on individual ranches and homesites. No additional NRL is considered necessary for urban-suburban expansion within the next 15 years. (BLM, Tonopah Planning Area Analysis; Esmeralda Unit Resource Analysis, 1976.)

PRELIMINARY DRAFT

Recreation Resources

Acreage figures in the 1975 Tonopah Unit Resource Analysis (URA) and the 1973 Esmeralda URA indicate that 98 percent of the total lands available for outdoor recreation within the study area are administered by the Bureau of Land Management (BLM), excluding Toiyabe National Forest land. All national resource lands (NRL), are assumed to have some degree of value for outdoor recreation, open space, scenery, or scientific and educational purposes. High-value recreation resources, as determined through BLM's Recreation Inventory System (BLM Manuals 6110, 6111, 6112), are delineated on the Recreation Resource Map.

PRELIMINARY DRAFT

RECREATION RESOURCE MAP

High-value lands for outdoor recreation, open space, scenery, or scientific and educational purposes as determined through the Recreation Inventory System are shown.

PRELIMINARY DRAFT

Recreation use areas are shown on the Land Use Map. These areas of recreation visitor concentration do not necessarily conform to the known, perhaps underutilized resources available throughout the study area, but rather, are usually a function of available physical and legal access, awareness or knowledge of the resource, and distance from population centers.

PRELIMINARY DRAFT

LAND USE MAP

PRELIMINARY DRAFT

Outdoor recreation resource categories considered in this section and some of the major uses are outlined in Table II-37, Recreation Resources and Activities. Scenery as a resource is discussed in the Visual Resource section of this chapter.

PRELIMINARY DRAFT

TABLE II-37
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
Campgrounds						
Berlin-Icthyosaur State Park	Nevada State Park	1	560	Sightseeing-Camping	10,000	Combines Berlin Historic State Park and icthyosaur paleonthology display 14 campsites; $2.00 fee/night
Peavine Creek Campground	U.S.F.S.	2	N/A	Fishing-Camping	4,000	7 family units; 1 group unit; no fee
Pine Creek Campground	U.S.F.S.	3	N/A	Fishing-Camping	4,000	25 family units; no fee
Cherry Creek Campground	U.S.F.S.	4	N/A	Fishing-Camping	400	10 family units; no fee
Rest Areas						
Blue Jay Roadside Rest	Nevada Highway Department	5	.5	Rest Stop-Sightseeing	1,000	Shade, picnic facilities, toilets One night camping only
Salisbury Roadside Rest	Nevada Highway Department	6	.5	Rest Stop-Sightseeing	8,000	Shade, picnic facilities, toilets One night camping only
Millers Roadside Rest	Nevada Highway Department	7	.5	Rest Stop-Sightseeing	1,000	Shade, picnic facilities, toilets One night camping only
Carvers Roadside Rest	Nevada Highway Department		.5	Rest Stop-Sightseeing	1,000	Shade, picnic facilities, toilets One night camping only
National Historic Register Sites						
Tybo Charcoal Kilns	BLM	8	60	Historical Sightseeing	100	60 acres will be withdrawn
James Wild Horse Trap	BLM	9	80	Historical Sightseeing	N/A	80 acres will be withdrawn

TABLE II-37
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
National Register of National Landmarks Site						
Lunar Crater	BLM	10	2,500	Geological Sightseeing	400	Maar Volcano Crater; 1,200 acres withdrawn from mineral entry
Historic Highway Markers						
Tonopah	Nevada Highway Department	11	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Tybo	Nevada Highway Department	12	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Belmont	Nevada Highway Department	13	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Manhattan	Nevada Highway Department	14	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Round Mountain	Nevada Highway Department	15	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Big Smoky Valley	Nevada Highway Department	16	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Ophir	Nevada Highway Department	17	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities
Ione	Nevada Highway Department	18	.5	Scenery-Historical Sightseeing	N/A	Highway turnouts, historic interpretive signs and litter barrels. No facilities

PRELIMINARY DRAFT

TABLE II-37
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
Lakes and Reservoirs						
Lockes and Big Well Ponds	BLM/Nevada Fish and Game	19	182	Fishing-Waterfowl Hunting	250	Located within Railroad Valley Wildlife Management Area
Rye Patch Reservoir	Private	20		Fishing-Picnics	100	
Moores Station Reservoir	Private	21		Fishing-Hunting	100	
Little Fish Lake	BLM/Private	22	30	Waterfowl Hunting	10	
Railroad Valley Pond	BLM/Nevada Fish and Game	23		Fish-Hunting	3	Railroad Valley Wildlife Management Area
Fishing Streams						
Six Mile Creek	BLM	38	15 (Stream Miles)	Trout Fishing	205	Back Country Use Area-Charcoal kilns, hunting, camping
Barley Creek	U.S.F.S/BLM	24	2 mi. BLM 8 mi. USFS	Trout Fishing	713	1973 Use Figures for all streams
Clear Creek	U.S.F.S/BLM	25	4 mi. BLM 5 mi. USFS	Trout Fishing	39	
Danville Creek	U.S.F.S./BLM	26	2 mi. BLM 1 mi. USFS	Trout Fishing	191	
Moore Creek	U.S.F.S./BLM	27	6 mi. BLM 1 mi. USFS	Trout Fishing	29	
Mosquito Creek	U.S.F.S./Private/ BLM	28	2 mi. BLM	Trout Fishing	N/A	

PRELIMINARY DRAFT

EX-220

TABLE II-37
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
Ophir Creek	U.S.F.S/Private/BLM	29	4.5 mi. BLM 5 mi. USFS	Trout Fishing	86	
Peavine Creek	U.S.F.S	30		Trout Fishing	24	
Pine Creek	U.S.F.S./BLM	31	2 mi. BLM 5 mi. USFS	Trout Fishing	126	
Twin River (North)	U.S.F.S	32		Trout Fishing	439	
Twin River (South)	U.S.F.S.	33		Trout Fishing	324	
Off-Road Vehicle Area						
Crecent Sand Dunes	BLM	34		Sand buggies-Sight-seeing	500	
Hunting Areas						
Hot Creek Range	BLM		See Land Use Map	Deer Hunting	600	Access points Big Cow Canyon, Morey Bench
Kawich Range	BLM		See Land Use Map	Deer Hunting	300	Access points Breens Ranch, Longstreets Ranch, Bellhellen Ranch, Eden Creek Ranch
Little Fish Lake Valley c/	BLM		See Land Use Map	Sage Grouse	100	

PRELIMINARY DRAFT

TABLE II- 37
MAJOR RECREATION RESOURCES AND ACTIVITIES

Site Name and Type a/	Ownership	Map No.	Size (acres)	Major Use Activities	Visitor-Days Per Year b/	Remarks
Primitive-Back Country Areas						
Morey Peak Primitive Area	BLM	35	14,800	Backpacking-Camping-Nature Study	Unknown	Will be designated in 1978
Six-Mile Back Country Use Area	BLM	36	17,680	Fishing-Camping	Unknown	Will be designated in 1978
Rockhound Areas						
Tonopah Gem Field	BLM	37	2,000	Mineral Collecting	400	Closed to material sales
Pine Nut Gathering Areas						
Hot Creek Mountain Range	BLM		See Vegetation Map-Pinyon Pine	Pinenut Collecting	1,000 Total	Use concentrated in areas shown on Land Use Map
Kawich Mountains	BLM					
Reveille Range	BLM					

a/ Sites and areas included on this table are only those where visitor use estimates are available.
b/ One "Visitor Day" equals 12 visitor-hours of use. This implies that one or more visitors participated in an activity for an aggregate total of 12 hours. Two people using an area for six hours each or 24 people using an area for one-half hour each would constitute one Visitor Day. An "average-length-of-use" factor for each activity would be required to convert Visitor Days to Activity Days or vice versa; but such data were not located.
c/ See Table II- , Hunter Use Data, for detailed information. Complete recreation resource inventory and use analyses located in Tonopah and Esmeralda Unit Resource Analysis files.

Abbreviations used in this table are: USFS, U.S. Forest Service; BLM, Bureau of Land Management; N/A, not available.

SOURCE: BLM, Tonopah Recreation Information System, URA Step 3, 1975.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Recreation Use: Major recreational activities in the Tonopah study area include driving for pleasure, sightseeing (ghost towns, wildlife, natural phenomena, petroglyphs, etc.), camping, hunting, fishing, "off-road" or four-wheel drive vehicle and motorcycle use, rockhounding, nature study, photography, pine nut picking, and scenery appreciation. The estimated utilization of the available views are discussed in the Visual Resources section.

Some recreation activities, i.e., vehicle-based camping, four-wheel drive and motorcycle use, are not dependent on the specific location of a natural resource. These activities may occur almost anywhere in the study area. Other uses, such as stream fishing, bighorn sheep or sage grouse hunting, and historical/archaeological sightseeing, can only occur within the rather limited boundaries of the specific resource.

Primitive values were evaluated in 15 separate rating areas covering a total of about 1,300,000 acres in the Tonopah Unit Resource Analysis. Primitive values are defined as lands effectively removed from the effects of civilization. The lands are roadless, in a relatively unspoiled condition, and otherwise offer opportunities for enjoyment of natural surroundings. Although there appear to be vast expanses of "primitive" resources on NRL, participation in traditional primitive-type recreational pursuits, i.e., backpacking, trail riding, hiking, and wilderness camping, are not known to be significant activities in the study area. Morey Peak will be designated as a 14,800 acre primitive

area, and 17,800 acres will be designated as the Six Mile Back Country Use Area. Both areas are in the Hot Creek Range.

Hunting - Hunting use is probably responsible for the occurrence of much of the camping and off-road vehicle use on NRL. The main contribution of NRL to hunting is to provide habitat for game species, and space to hunt mule deer, chukar, sage grouse, and rabbits. Visitor use data for hunting shown in Table II-38, is based on Nevada Department of Fish and Game statistics, Volume 6, Water for Nevada Fish and Wildlife, user group input through the Recreation Inventory System in the Tonopah Unit Resource Analysis (URA), and from hunter use data included in Allotment Management Plans.

TABLE II- 38

PRESENT AND FUTURE BIG GAME HUNTER-DAYS PER YEAR
WITHOUT THE PROPOSED ACTION

Allotment	Present Hunter Days/Year			Total Hunter Days	Hunter Days/Year by 1990			1990 Total	Total Increase Hunter Days	Total Percent Increase
	Deer	Antelope	Bighorn Sheep		Deer	Antelope	Bighorn Sheep			
Blue Eagle	*	0	0	0	*	0	5	5	5	500
Butterfield	355	0	0	355	496	1	10	507	152	43
Nyala	21	4	21	46	31	7	21	59	13	28
Reveille	126	14	0	140	248	21	0	276	136	97
Hot Creek	944	6	0	950	1,860	9	0	1,869	919	97
Wagon Johnnie	228	14	0	242	228	14	0	242	0	0
Stone Cabin	236	12	0	248	372	23	0	395	147	59
Ralston-Monitor	42	12	0	54	62	23	0	85	31	57
Hunts Canyon	*	4	0	4	0	7	0	7	3	75
Francisco	10	0	0	10	19	0	0	19	9	90
Darrough Hot Springs	27	0	0	27	62	0	0	62	35	130
Ione	*	0	0	0	0	0	0	0	0	0
San Antone	223	0	*	223	347	0	0	347	124	56
Willow Creek	*	0	0	0	0	0	0	0	0	0
Total	2,221	66	21	2,308	3,725	121	36	4,220	1,574	68%

* No Data

Source: Battle Mountain District, Allotment Management Plans, 1976.

Fishing - The Tonopah study area contains about 16 miles of fishable trout streams and four reservoirs. Data developed from a six-year study (1968-1973) by the Nevada Department of Fish and Game attributed 1,264 visitor-days of fishing to NRL. (BLM, Tonopah Planning Area Analysis, 1976).

Collecting - About 1,000 visitor days per year can be attributed to pine nut picking. Pinyon pine woodlands are found over about 100,000 acres, but most recreational collecting appears to be concentrated in two areas in the Hot Creek Range and four areas in the Kawich Range. Both are near good vehicle access.

Eleven rock collecting areas were identified in the Tonopah Step 3 URA recreation inventory. Most of these are associated with old mining districts or mines and mill sites. They are used mostly for rockhounding because of known mineral values and good vehicle accessibility.

Although objects of antiquity and archaeological artifacts are protected under the Antiquities Act of 1906 (34 Stat. 225), illegal collecting appears to be a common occurrence areawide. Arrowheads may be found almost anywhere in varying abundance. "Ghost towns" and old buildings, as well as garbage dumps, stage stations, old ranches and other historic activity sites, are major attractions to antique collectors. See photo Illustration II-15 for an example of a historic sightseeing area. Only those cultural resources that offer opportunities for sightseeing, interpretative, or educational uses were listed on the Recreation Resources Map. Detailed discussion of archaeological, historical, and contemporary cultural features is found in the Cultural Resources section of this chapter.

Illustration II-15. Photograph of sightseeing at historic area as an example of visitor use.

Off-Road Vehicles (ORV) -- Crescent Sand Dunes, a 1,300 acre dune field about 15 miles north of Tonopah, provides about 500 visitor days per year of sand buggy and other specialized off-road vehicle recreation use. Organized competitive events at Crescent Dunes decreased from two events per year to none during the period 1971-1975. Other ORV use data is not available. Most ORV use is assumed to take place on the extensive unimproved road systems. Four-wheel drive vehicles seem to be used more as a means to an end; that is, as a method of transportation into back country for hunting, fishing, rockhounding, or sightseeing, and not for the "off-roading" experience. (See photo Illustration II-16.)

Illustration II-16. Sand Buggies at the Crescent Dunes, an Off-Road Vehicle Use Area.

PRELIMINARY DRAFT

Livestock Grazing

The Tonopah study area is presently (1976) divided into 20 grazing areas. These areas include both grazing allotments and administrative units. Administrative units were established to facilitate award of grazing privileges shortly after establishment of the Battle Mountain Grazing District in 1951. They generally coincide with historical grazing areas of one or more ranches. Since 1951, some of the "units" have been divided into grazing allotments for individual grazing users. In most cases, however, administrative units are still used as the grazing area entity. Where confusion may exist from using "unit" or "allotment", the term "grazing area" will be used in this description. The Range Management Program Features Map in Chapter I shows the location of these entities.

There are 28 ranching operations licensed to graze livestock in the study area. Of these, 19 are based within the resource area, and nine are from outside. (The nine operations based outside the area are: Held; Rouse; Goicoechea; Corta; M & N Livestock; Brown; Carpenter; Paris, Paris and Inchauspe; and Tomba Cattlemen.) Both cattle and sheep use the range, with cattle being the predominant class of stock. Table II-39, Grazing Users, Class of Stock, Acreage by Use Area, gives this information in more detail.

PRELIMINARY DRAFT

TABLE II-39

GRAZING USERS, CLASS, AND NUMBERS OF STOCK,
AND ACREAGE BY USE AREA

Grazing Area	Total Acreage a/	User	Class of Stock b/	Base Herd Size
Blue Eagle Allotment	54,520	Leroy Sharp	C	240
Butterfield Springs Allotment	137,560	Carl Hanks	C	250
Nyala Allotment	330,851	Sharp Partnership	C	900
Reveille Unit	753,601	Fallini	C	2,120
Hot Creek Unit	153,214	Peterson	C	4,500
Morey Unit	138,830	Peterson	C	
Sand Springs Unit	213,090	Peterson	C	
		Held	S	
		Rouse	S	
		Corta	S	2,700
		M & N Livestock	S	1,800
		Goicoechea	S	
Crater Black Rock Allotment	94,311	Peterson	C	
Wagon Johnnie Allotment	110,344	Colvin	C	1,350
Stone Cabin Allotment	376,920	Colvin	C	
		Stone Cabin Partnership	C	404
		Meyer	C	
Page Springs Allotment	20,869	Meyer	C	150
Ralston Allotment	371,628	Arcularius Brothers	C	2,000
Monitor Unit	108,570	Arcularius Brothers	C	
		Bumguardner	C	604

PRELIMINARY DRAFT

II-230

TABLE II-39

GRAZING USERS, CLASS, AND NUMBERS OF STOCK,
AND ACREAGE BY USE AREA

Grazing Area	Total Acreage a/	User	Class of Stock b/	Base Herd Size
Hunt's Canyon Allotment	93,957	Bumguardner	C	
Francisco Allotment	16,000	Osterhoudt	C	100
Smoky Unit	135,053	Zimmerman	C	2,000
		Darrough	C	190
		Berg	C	40
Ione Unit	217,994	Brown	C	355
		Carpenter	S	5,400
		Parris, Paris, and Inchauspe	S	2,500
		Yomba Cattlemen	C	700
		Zimmerman	C	
Stewart Springs Allotment	26,800	Yomba Cattlemen	C	
San Antone Unit	452,090	Zimmerman	C	
Willow Creek Allotment	12,385 (NRL)	Bumguardner	C	

a/ Taken from Unit Resource Analysis. Acreages are different from those in Allotment Management Plans because of boundary changes.

b/ Abbreviations used are: C, cattle; S, sheep.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

The cattle ranches in the Tonopah area are generally large and extensive cow-calf operations with heavy dependence on national resource lands (NRL). Allotments vary in size from approximately 12,000 to 750,000 acres, and cattle herd sizes vary from 40 to 4,500 head. The average of all grazing areas is 191,000 acres and the average herd size is 990 cattle. (See Table II-39, Grazing Users, for information on each area.) These operations are extensive in that they utilize relatively few management facilities, brand and calve on the open range, and seldom handle their cattle. They operate with relatively little overhead expense and depend a great deal on the individual cow being able to take care of herself and her calf. Calves are born year-round. These ranches operate with 30 to 60 percent calf crop. Calves weigh 300 to 400 pounds at eight months of age (information from BLM field personnel and Mitchell and Garrett (Range Cattle Industry, unpublished report, 1976). This extensive kind of operation with large numbers of cattle permitted over large areas, produces a living for one or two families. Both calves and yearlings are marketed depending upon when the calf is born and when it is gathered. Table II-40, Summary of Grazing Use, summarizes the extent of each operation.

Livestock movements generally correspond to the changing of the seasons and the weather. Cattle generally are allowed to drift rather than being gathered and driven. In the spring, cattle drift toward higher elevations as the snow recedes and new plant growth appears. They move down in the fall with cold weather and snow. Operators adjacent to national forest lands have summer grazing permits on the National Forest; those who are not, generally utilize higher elevations and/or adjacent mountain ranges on NRL. Cattle in the valleys during summer move under or behind thundershowers to find entrapped water and green grass. This kind of operation can exist only from the lack of fences.

TABLE II-40

SUMMARY OF GRAZING USE

Grazing Area	User	Class of Stock	Season of Use	Active Grazing Use (5 year average) AUMs a/	Regular Non-Use (5 year average) AUMs a/
Blue Eagle Allotment	Leroy Sharp	C	3/1-2/28	2,024	0
Butterfield Springs Allotment	Carl Hanks	C	3/1-2/28	1,933	2,846
Nyala Allotment	Sharp Partnership	C	3/1-2/28	9,492	661
Reveille Unit	Fallini	C	3/1-2/28	25,156	550
Hot Creek Unit	Peterson	C	3/1-2/28	3,093	3,354
Morey Unit	Peterson	C	5/1-9/30	1,750	500
Sand Springs Unit	Peterson	C	11/1-3/31	1,687	2,221
	Held	S	12/1-1/31	0	1,189
	Rouse	S	12/1-1/31	0	810
	Corta	S	12/1-1/31	667	260
	M & N Livestock	S	11/1-3/31	1,512	709
	Goicoechea	S	12/1-1/31	555	1,161
Crater Black Rock Allotment	Peterson	C	12/1-2/28	2,817	2,908
Wagon Johnnie Allotment	Colvin	C	6/11-10/31	2,388	0
Stone Cabin Allotment	Colvin	C	3/1-2/28	10,159	0
	Stone Cabin Partnership	C	3/1-2/28	3,155	0
	Meyer	C	4/1-2/28	1,264 (2 year average)	442 (2 year average)
Page Springs Allotment	Meyer	C	4/1-6/30	182 (2 year average)	0
Ralston Allotment	Arcularius	C	11/16-6/15	12,635 (3 year average)	2,060 (3 year average)

PRELIMINARY DRAFT

TABLE II-40

SUMMARY OF GRAZING USE

Grazing Area	User	Class of Stock	Season of Use	Active Grazing Use (5 year average) AUMs a/	Regular Non-Use (5 year average) AUMs a/
Monitor Unit	Arcularius	C	6/15-11/15	3,011	851
	Bumgaurdner	C			
Hunt's Canyon Allotment	Bumguardner	C	3/1-2/28	3,741	0
Francisco Allotment	Osterhoudt	C	3/1-2/28	631 (3 year average)	668 (3 year average)
Smoky Unit	Zimmerman	C	11/1-6/30	2,800 b/	2,471 b/
	Darrough	C	3/1-2/28	1,030	0
	Berg	C	5/1-7/31	120	0
Ione Unit	Brown	C	4/1-5/31	690	250
	Carpenter	S	12/1-3/31	663	687
	Paris, Paris, and Inchauspe	S	12/1-3/31	1,395	943
	Yomba Cattlemen	C	11/1-4/30	4,172	1,676
	Zimmerman	C	11/1-11/15	118	182
Stewart Springs Allotment	Yomba Cattlemen	C	11/1-4/30	462	394
San Antone Unit	Zimmerman	C	11/1-6/30	11,160 b/	3,105 b/
Willow Creek Allotment	Bumguardner	C	6/11-10/10	338 (3 year average)	0

a/ Taken from Allotment Management Plans, Current situation and history section.

b/ 1976 license year only; allotment recently acquired.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

In the Tonopah study area one small allotment, Willow Creek, which is administered by the Forest Service, is completely fenced. Most unit boundaries are open; almost none of the adjacent National Forest boundaries are fenced. This situation is illustrated in the Grazing Areas and Existing Improvements Map.

The exceptions to these large and extensive operations are those of Osterhoudt, Darrough, and Berg. These individuals are permitted relatively small numbers in small allotments. Osterhoudt grazes yearlong in the Francisco allotment. The small area and the few numbers of cattle permitted, in addition to being completely fenced, except against the National Forest boundary, allows the operator to watch his cattle closely. During the summer, part of the herd is gathered and trailed to national forest land. Darrough and Berg graze together in an unfenced area of the Smoky Unit. The few permitted cattle stay close to home and are gathered annually. Berg is permitted on NRL for about three months; he is on private land the balance of the year. Darrough trails to national forest land during the summer, and is on NRL the balance of the year. Both Osterhoudt and Darrough utilize NRL for most of their yearlong operation.

Most of the permitted ranching operations in the Tonopah study area depend on NRL for all, or a large part of their year-round grazing operation. National forest lands generally contribute the balance of the yearlong operation. Table II-41, Dependence of Ranching Operations, displays this dependence for each user. Private lands are used to control access to water and to produce hay and/or green feed for saddle horses, milk cows, and other such domestic stock. The

TABLE II-41

DEPENDENCE OF RANCHING OPERATIONS ON NATIONAL RESOURCE LANDS, NATIONAL FOREST LANDS, AND PRIVATE LANDS a/

User	Grazing Area	Dependence NRL (percent)	Dependence NFL (percent)	Dependence Private (percent)	Dependence Tonopah Resource Area (percent)	Comments
Leroy Sharp	Blue Eagle Allotment	70	0	30		
Carl Hanks	Butterfield Allotment	82	8	10		
Sharp Partnership	Nyala Allotment	89	3	8		
Fallini	Reveille Unit	99	0	1		Water base - no use of private lands required.
Peterson	Hot Creek Unit Morey Unit Sand Springs Unit Crater Black Rock Allotment	80	6	14	27	Also licensed to graze in Ely District and in Shoshone-Eureka resource area, Battle Mountain District
Held	Sand Springs Unit				0	100 percent non-use in Tonopah resource area last five years.
Rouse	Sand Springs Unit		0		0	100 percent non-use in Tonopah resource area last five years.
Goicoechea	Sand Springs Unit	Figures not immediately available			very little	68 percent non-use in Tonopah resource area last five years.
Corta	Sand Springs Unit				8 c/	92 percent of grazing licensed in Elko and Ely districts and NFL.
M & N Livestock	Sand Springs Unit	Figures not immediately available			23 c/	Dependence 23 percent based on 1976 grazing license Battle Mountain District. Also licensed in Bakersfield District, California
Colvin	Stone Cabin Allotment Little Fish Lake Unit	82	3	15		

PRELIMINARY DRAFT

II-236

TABLE II-41

DEPENDENCE OF RANCHING OPERATIONS ON NATIONAL RESOURCE LANDS, NATIONAL FOREST LANDS, AND PRIVATE LANDS a/

User	Grazing Area	Dependence NRL (percent)	Dependence NFL (percent)	Dependence Private (percent)	Dependence Tonopah Resource Area (percent)	Comments
Meyer	Page Springs Allotment	91	0	9		
Stone Cabin Partnership	Stone Cabin Allotment	85	4	11		Little potential to significantly reduce dependence NRL.
Arcularius	Monitor Unit Ralston Allotment	78	14	8		Potential to significantly reduce dependence NRL.
Bumguardner	Hunt's Canyon Allotment Monitor Unit Willow Creek Allotment	54	38	8		
Osterboudt	Francisco Allotment	53	7	40		
Berg	Smoky Unit	25	0	75		
Darrough	Smoky Unit	45	18	37		
Brown	Ione Unit	70	23	7	17	Also licensed to graze in Carson City District and Shoshone-Eureka resource area, Battle Mountain District.
Carpenter	Ione Unit	Figures not immediately available			10	Heavily dependent on National Resource Land and National Forest Land. Also licensed to graze in Elko District, Carson City District, and Shoshone-Eureka resource area, Battle Mountain District.
Paris, Paris, and Inchauspe	Ione Unit	66	25	9	20 c/	Also licensed to graze in Carson City District and Shoshone-Eureka resource area, Battle Mountain District. Heavily dependent on National Resource Land and National Forest Land.

PRELIMINARY DRAFT

TABLE II-41

DEPENDENCE OF RANCHING OPERATIONS ON NATIONAL RESOURCE LANDS, NATIONAL FOREST LANDS, AND PRIVATE LANDS a/

User	Grazing Area	Dependence NRL (percent)	Dependence NFL (percent)	Dependence Private (percent)	Dependence Tonopah Resource Area (percent)	Comments
Yomba Cattlemen	Ione Unit Stewart Springs Allotment	48	42	10		
Zimmerman	Smoky Unit San Antone Unit	65	22	13		

a/ See appendix K for explanation of dependence computations.

b/ For those operators whose grazing use in the Tonopah Resource Area is a small portion of their total operation.

c/ These users graze sheep in either Ione or Sand Springs units during winter. Their dependence on the Tonopah resourse area depends upon the amount of snow in these areas. Sheep are watered on snow. If there is no snow, no use at all may be made, reducing to zero their dependence on the area for that year. Figures given assume adequate snow.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

few rancher owned or controlled private lands contribute to this dependence on federally owned lands. Approximately 26,320 acres of patented land exists within all grazing areas. This equals 0.7percent of NRL. To perhaps an even greater degree, however, the disuse, or lack of intensive use, of what private lands there are contributes more heavily to this dependence.

Most of the private land belonging to grazing permittees currently (1976) produces less forage (green feed or hay) than they once did, and considerably less than their potential (Peterson, personal communication, 1976). Some lands are not used and many are not intensively managed, or-"farmed".

Only the Ione and Sand Springs areas are licensed for sheep grazing. (They also support cattle during part of the year.) The permitted sheepmen utilize these areas as winter range as part of year-round trailing operations based outside the study area. Lamb and wool are the commodities marketed.

There are three areas outside the study area which are important to this description: the Stewart Springs allotment, the Columbus-Monte Cristo allotment, and the Arcularius allotment. All three are located on the west side of the study area. See the Grazing Area Map for the location of each.

The Stewart Springs allotment is in the Carson City BLM District immediately west of the Ione unit. It is split into two sections by a point of the Ione unit. This area is administered by the Battle Mountain District under an interdistrict agreement. Grazing is licensed to the Yomba Cattlemen only, though no fence separates this area from the Ione unit, which is used in common

PRELIMINARY DRAFT

by several operators. Part of the proposal is to include the Stewart Springs allotment with the Ione unit to form the Ione allotment.

The Columbus-Monte Cristo allotment lies immediately south of the San Antone unit in the northeast quarter of Esmeralda County. It incompasses approximately 496,000 acres. Livestock grazing is currently (1976) licensed to Evan Zimmerman by the Las Vegas District. Zimmerman is also licensed to graze in the San Antone and Smoky units of the study area. Because grazing in this allotment is a part of Zimmerman's ranching operation and because it is next to the bulk of his use area in the study area, it is proposed the Columbus-Monte Cristo allotment be part of the Zimmerman AMP. Grazing on the area would be administered by the Battle Mountain District.

The Arcularius allotment is located immediately south of Tonopah, between the Nye-Esmeralda county line and Highway US 95; it encloses approximately 23,665 acres. This area is administered by the Las Vegas District; livestock grazing is licensed to Arcularius Brothers. This operation is also licensed to graze in the Ralston and Monitor units of the study area. This allotment is next to the Ralston unit and is unfenced. It is proposed to include this smaller area in the AMP for Arcularius Brothers in the study area. It would be administered by the Battle Mountain District. (Refer to the Range Management Program Features Map in Chapter I.)

PRELIMINARY DRAFT

Agriculture

Crop production in the Tonopah study area is limited to 32,440 acres of private farms and ranches. This includes ranching-base property used to raise alfalfa and native hay as livestock feed and alfalfa seed. According to the 1969 Census of Agriculture, the average farm in Nye County had 284 acres of cropland and employed 2.88 workers for more than 150 days per year. (BLM, Tonopah Planning Area Analysis, 1976.)

Suitability of lands for potential agricultural development has been estimated at 14,809 acres, based on soils characteristics and available water. (Water for Nevada, 8, 1974.)

The only legal means of transfer of national resource land (NRL) for private agricultural development is the Desert Land Entry Act which limits farm units to 320 acres. It is highly probable that the Bureau of Land Management (BLM) will be granted new authority to transfer suitable agricultural lands to private ownership by 1990. (BLM, Tonopah Planning Area Analysis, 1976.)

PRELIMINARY DRAFT

Mineral Resources

The Tonopah study area contains a large number of mineralized areas with mineral deposits located in the younger volcanics and in the older sediments as well. The most significant silver and gold producers in the past have been situated in or associated with the younger volcanics, such as at Round Mountain and Tonopah. The magnesite-brucite deposits at Gabbs have the older Triassic dolomites as their source.

Other minerals that have been, or are being produced in the resource area include: iron, mercury, zinc, lead, arsenic, antimony, fluorspar, tungsten, turquoise, and diatomite. Platinum has been found (in association with gold and silver), but there has been no significant production.

Cobalt, lithium, beryllium, nickel, manganese, selenium, copper, uranium, and vanadium exist in the study area, but production has been slight. Commercial production potential exists, depending upon demand and price levels.

Sand and gravel supplies are good throughout most of the area. Dimension stone has been produced.

The figures on mineral production values are incomplete for the study area. Figures published in the Minerals Yearbook for 1971 and 1972 are $2,327,000 and $2,047,000, respectively. These figures are for all of Nye County, but are probably close to actual production values in the study area. See Appendix K for a list of mineral areas and accompanying maps regarding presence of minerals.

PRELIMINARY DRAFT

Woodland Products

There are presently 485,000 acres of pinyon-juniper woodland in the Tonopah study area. Over 404,000 acres, or about 83 percent, of the mentioned forest type produces less than the 20 cubic feet per acre year of growth necessary to qualify as "productive forestland". The balance of the forested acreage is considered nonproductive in terms of commercial wood products. No saw timber or pulpwood resources exist in the study area.

The only forest product use in the study area at this time is for firewood, fenceposts, Christmas trees, and pine nuts. No commercial operations are dependent on these products. Quantity and quality of wood product sources, with the exception of fuel wood, is considered poor. (Bureau of Land Management, Tonopah Unit Resource Analysis Step 3; Tonopah Planing Area Analysis 1976.)

Table II-42, Woodland Products, shows production figures in the study area. Demand and use is by ranchers for fenceposts and other local residents for Christmas trees, pine nuts, and firewood.

PRELIMINARY DRAFT

TABLE II-42
WOODLAND PRODUCT SALES (PINYON-JUNIPER WOODLAND)
IN TONOPAH STUDY AREA

Year	Product	Board Feet (BLM)	Board Feet (Other)	Total	Percent BLM
1968-1972	Posts	1,000	33,000	34,000	3
1968-1972	Fuelwood	0			
1968-1972	Christmas trees	0	-	-	-
1975	Posts	7,000	2,000	9,000	78
1975	Fuelwood	13,000	37,000	50,000	26
1975	Christmas trees	100	285	385	26

SOURCE: Bureau of Land Management (BLM), Tonopah Resource Area Planning Area Analysis, 1975.

PRELIMINARY DRAFT

Transportation

There are about 430 miles of Federal and State highways in the Tonopah study area. About 300 miles are two-lane, paved highways; the balance are high-standard, single-lane paved or unpaved roads. Most are maintained regularly and are passable by passenger cars when dry. All paved roads are snowplowed and kept open in winter; unpaved roads are not plowed or necessarily open. The Transportation System Map shows the roads and highways serving the study area. A complete inventory of roads, including easements, is located in the Tonopah Unit Resource Analysis (URA) Step 2.

Nye County has 560 miles of improved roads under its jurisdiction within the study area. About 50 miles of road are maintained in the Esmeralda County portion of the area. Some major county roads have been graveled, but most are high-standard dirt roads with drainage ditches and culverts. There are 710 miles of generally low-standard dirt roads under Bureau of Land Management (BLM) jurisdiction. Most are not passable by passenger car, but require high-clearance or four-wheel drive vehicles. Very few of these roads have adequate drainage features, so they are subject to damage from flash flooding during summer thundershowers or spring snow melt. These conditions make them virtually unusable when wet. (BLM, Tonopah URA, 1975).

PRELIMINARY DRAFT

TRANSPORTATION SYSTEMS MAP

Roads and highways serving the Tonopah Study Area are shown.

PRELIMINARY DRAFT

Airfields located at Gabbs, Tonopah, and Currant serve the general public and business aircraft, but there is no regularly scheduled airline service into the area. Bus service from Tonopah links the region to Reno, Ely, and Las Vegas. Truck freight is available on a limited basis; rates are high, since major trade centers are 100 to 400 miles away. There is no railroad service into the study area.

Utility Systems

Utility systems within the Tonopah planning unit of Nye County comprise approximately 350 miles of linear rights-of-way across NRL. A right-of-way is defined as a path which is legally designated for the use of power transmission, communications, or water supply. (BLM, Tonopah PAA, 1975.)

Domestic water supply pipelines from Ryepatch Wells, about 15 miles northeast of Tonopah in Ralston Valley, serve the town of Tonopah. The community of Round Mountain receives water from springs about five miles away. (Walters, Chilton Engineering, Nevada Rural Water Plans, 1972.)

Tonopah and northern Nye County receive electricity from Sierra Pacific Power Company. Natural gas is available in Gabbs from Southwest Gas Corporation. There is no natural gas service in Tonopah.

Transmission lines and gas and water pipelines are shown on the Land Use Map.

PRELIMINARY DRAFT

SOCIAL-ECONOMICS

The following social-economic conditions for the existing environment in the Tonopah study area is based on a 1976 study done for BLM by Dr. M. Richard Ganzel of the University of Nevada-Reno.

PRELIMINARY DRAFT

Social and Economic Conditions

The Bureau of Land Management's (BLM) Tonopah study area is situated within northern Nye County, Nevada. Its lower mountain slopes and valleys occupy much of the land in the townships of Gabbs, Round Mountain, and Tonopah. Most higher mountain terrain is public land administered by the United States Forest Service. The resource area terminates abruptly on its southern flank where it meets the federal military weapons testing site. Much of the resource area is relatively isolated, primarily due to its remoteness from population centers and the limited volume of economic activity in the area. However, the town of Tonopah is located on the major highway linking Las Vegas to Reno, and paved roads penetrate most major valleys.

Historically, the region has experienced extreme variation keyed to "boom and bust" mining activities. Erratic levels of federal military-related activities in recent decades have reinforced that pattern. Four sources of demographic and economic stability have partially offset these disruptive forces. First, Tonopah is the county seat and provides regular governmental services. Second, the town serves as a local administrative center for a range of activities which includes highway and public utility maintenance, as well as BLM and United States Forest Service functions. Third, Tonopah's location on a transportation artery between growing urban centers has meant an

PRELIMINARY DRAFT

important service role catering to increasing numbers of pass-through and smaller numbers of visiting tourists. Finally, agriculture -- dominantly grazing on national resource lands (NRL) -- has been a fourth source of regional stability, though such agriculture supports a slowly declining and numerically small portion of the region's population.

The remoteness of the region, the sparseness of its population, and the dependence of important portions of its economy on decisions made elsewhere and on visitors headed elsewhere create distinctive cultural patterns and result in an unusual requisite of accurate statistical portrayal. An accurate description of the present situation cannot approximate a photograph; instead, it must capture the fluctuations of governmental activity and mining activity. It must also show the present within established trends for more stable factors. The "ghost" mining towns of Belmont and Manhattan, the visibly prosperous residential neighborhood of governmental employees overlooking older sections of Tonopah, and the thriving motel and restaurant facilities of Tonopah are equally part of the present reality.

The Study Area

In order to place ranch activities and BLM-administered grazing allotments within a sound context, this section provides a detailed description of the total population group in the region, together with information on available public services and on relevant social, cultural, and political attitudes. Data is

PRELIMINARY DRAFT

presented for the county and, when appropriate and available, for smaller groupings.

Demographic Data: The population of Nye County, as described in Table II-43, Nye Population, currently numbers approximately 5,400, a small decline from the recent peak reported in the 1970 census. Past totals indicate extreme fluctuation, and there is no certainty that the future will be more stable. In fact, two recent projections for 1980 differ in the direction which they predict population change will take (see Table II-43, for references). Professor Chu, an experienced economist and demographer at the University of Nevada, Reno, estimates that county population will decline 10 percent during the present decade. In contrast, the Nevada Division of Water Resources expects an increase of 25 percent. These wide discrepancies reflect the fact that major determinants of population are outside the region, making precise prediction impractical and risky.

The population of 5,599 registered by the 1970 census was predominantly of Caucasian ancestry, with an American Indian minority of four percent and only a few inhabitants of other racial ancestries. Males outnumbered females by a wide margin, comprising 56.4 percent of the total. This imbalance may be reflected in the age structure of the population, which shows a smaller portion of people under the age of 30 than the average for Nevada and a correspondingly higher portion of the population above

PRELIMINARY DRAFT

that age. During the decade of the 1960s, births exceeded deaths in the county by 898. Net migration added 871 persons to the population increase (Miller et al., Nye County, Nevada, Information Report, 1976).

TABLE II-43

POPULATION OF NYE COUNTY, NEVADA[a/]

Year	Number
1910	7513
1930	3989
1950	3101
1960	4374
1970	5599
1975 (estimate)	5400[b/]
1980 (projected)	5000[c/]
1980 (projected)	7000[d/]

a/ Miller, W., et al. Nye County, Nevada, Information Report, University of Nevada, Reno: Cooperative Extension Service, Max C. Fleischmann College of Agriculture, August 1976.

b/ U.S. Bureau of the Census. Current Population Report, Federal-State Cooperative Program for Population Estimates, Series P-26, No. 75-28, August 1976.

c/ Chu, S. F. Nevada Population Projection: by County for Selected Years, 1970-2000, University of Nevada, Reno: Bureau of Business and Economic Research, March 1975.

d/ Nevada Division of Water Resources, Water for Nevada: Forecasts for the Future-Population Carson City: Nevada State Engineer's Office, February 1973.

PRELIMINARY DRAFT

The net natural increase of 100 between 1970 and July 1, 1975, has been more than offset by an exodus of 300 people from the region during this period (Census Bureau, Current Population Reports, August 1976). Although no statistical data is available covering the current year, an observable increase in mining-related activities and a sharp jump in fall of 1976 school enrollment at Round Mountain may indicate another period of growth. (Information provided by a teaching aide hired to help serve the unexpectedly large September 1976, enrollment.)

Although the 1970 population represents an average density of only 0.3 persons per square mile, it is by no means evenly distributed over the county. As Table II-44 , Population by Subdivisions, shows, 3,505 of the 5,599 county residents in 1970 lived within the townships of Gabbs, Round Mountain, and Tonopah. The unincorporated town of Tonopah has a population of 1,716 and the city of Gabbs includes an additional 874 persons. Other population clusters include Round Mountain and Carver's Station in the Smoky Valley, Ione and Currant on opposite ends of the resource area, and the concentration of Indians in the Yomba and Duckwater areas. In summary, most people within or adjacent to the Tonopah study area live within small communities rather than as isolated family units.

PRELIMINARY DRAFT

TABLE II-44

POPULATION FOR SELECTED NYE COUNTY SUBDIVISIONS, 1970[a/]

Place	Number
Gabbs Township	1,000
Gabbs	(874)
Round Mountain Township	215
Tonopah Township	2,290
Tonopah	(1,716)
Total	3,505

a/ U.S. Bureau of Land Management, Socio-Economic Profile, Battle Mountain District, Nevada, April 1976.

Education: The educational characteristics reported in the 1970 census suggest a relatively high level of formal education. The median number of school years completed by male residents 25 years old and older was 12.3; for females, 12.2. For each sex, between 59 and 60 percent had graduated from high school (Miller, et al., Nye County, Nevada, Information Report, 1976). These figures must be put into a realistic, if rough, context. First, no university or community college courses are taught in the area. Second, the two secondary schools serving the area, at Gabbs and Tonopah, must bus students long distances from the outlying areas. Moreover, they lack well-developed vocational courses which might establish linkages between education and the ranching, mining, construction, and service jobs which children raised in the area

PRELIMINARY DRAFT

expect to perform as adults. Finally, it is apparent that much migration into the area represents professionals who are the administrators of governmental functions, the school teachers, and the military and communication personnel resident in the area. These professionals' educational attainments are reflected in Census data. It is indicative of this migration that only one employee of the BLM in the Tonopah office was from the area and that the individual occupied a non-professional position (information from interviews with Tonopah BLM personnel).

In addition to secondary educational facilities, five elementary schools serve the study area. These elementary schools are located at Duckwater, Gabbs, Round Mountain, Tonopah, and Yomba. The elementary and secondary school systems at Gabbs and Tonopah also include special education and kindergarten programs. Enrollment in these four programs -- special education, kindergarten, elementary, and secondary education -- totaled 705 for the tenth month of the 1975-76 school year. That figure was down from 731 during the same month of the previous year. Table II-45, Nye School Enrollment, provides a breakdown of enrollment figures by school. Data for each program is furnished in Appendix A.

PRELIMINARY DRAFT

TABLE II-45

NORTHERN NYE COUNTY SCHOOL ENROLLMENT STATISTICS[a/]

School	1974-75	1975-76
Duckwater	7	7
Gabbs	220	218
Round Mountain	30	39
Tonopah	459	424
Yomba	15	17
	731	705

a/ This data was provided by Joaquin Johnson, superintendent, Nye County School District. It covers the tenth month (May 10, 1976, to June 4, 1976) of the 1975-76 school year and the comparable month of the previous year.

Other Public Services: The only hospital in Nye County is located in Tonopah. It combines surgical, obstetrical, general, and long-term health care in a single facility. It has 19 general beds and is licensed for 24 skilled nursing beds. Two physicians live in Tonopah. A dentist and an optometrist from Bishop, California, pay monthly visits and work out of office space provided by the hospital (Miller, et al., Nye County, Nevada, Information Report, 1976). Some local residents travel to Bishop for their medical and dental care (information from interviews).

All public safety is provided by the Nye County Sheriff's office. Nye County employs 25 regular enforcement personnel and also

PRELIMINARY DRAFT

utilizes five volunteers (BLM, Socio-Economic Profile, Battle Mountain District, Nevada, 1976). They must patrol a large but sparsely populated territory. No evidence was obtained which might suggest inadequate enforcement.

Three other public services merit brief discussion. The lack of privately-owned land within the region creates a need for solid waste disposal sites, which will have to be on what now is publicly-owned land. Secondly, only Gabbs and Tonopah have centralized sewage treatment facilities. The adequacy of these and of individual septic tank and cesspool facilities is under study by local, State, and national interests.
Finally, transportation facilities for the region are extremely limited. There is bus service but no railroad service. One air flight arrives at and departs from the Tonopah airport each day, but its limited passenger capacity is available only to banking and State employees. This tends to isolate the region. However, aside from the good road system which already exists, it is difficult to justify additional services on economic grounds.

Income and Employment: The provision of detailed income and employment information for the Tonopah study area is complicated by a number of factors. Many individuals employed in Nye County live outside the county. It is also common for many individuals to hold more than one job. The shifting number of federal (especially the Energy Research and Development Administration (ERDA) test site) employees working within the county makes

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PRELIMINARY DRAFT

any effort to link income and employment to sectors necessarily an approximation. Finally, the latest agricultural census data is for 1969, a fact which is especially important because of the distinctively different forms taken by agricultural activity in northern and southern Nye County.

Employment patterns for Nye County residential employees (1970) indicate the largest employment category is services. Government (excluding test-site employees) ranks second on the basis of Nevada Employment Security Department figures and definitions. Using those same figures, mining ranks third; wholesale and retail trade rank fourth; and agriculture ranks fifth. However, tables constructed from United States census data present a different rank order. On that basis, services rank first; trade ranks second; construction, third; mining, fourth; and government, fifth. It is important to note that for an easy-to-categorize activity, agriculture, the numbers employed are virtually identical (BLM, Socio-Economic Profile, Battle Mountain District, Nevada, 1976, Table 8; Miller et al., Nye County, Nevada, Information Report, 1976, Tables 34 and 35).

A number of trends in employment seem significant. Between 1970 and 1974, agriculture employment declined slightly. Mining employment jumped sharply, from 350 to 440 employees. Two other employment categories showed significant increases: construction and transportation-public utilities (lumped together) (BLM,

PRELIMINARY DRAFT

Socio-Economic Profile, Battle Mountain District, Nevada, 1976, Table 9, p. 35). It is probable that much of the jump in these categories is directly related to mining. Barite, for example, is trucked through Tonopah to the rail head at Mina for eventual use in the Texas petroleum industry (BLM, Planning Area Analysis, Tonopah Resource Area, 1976).

Per capita income for Nye County was estimated at $3,912 in 1972. That level was 71 percent of the national average (BLM, Socio-Economic Profile, Battle Mountain District, Nevada, 1976). However, there are relatively few people below the poverty level in the county. Similarly, relatively few families earn exceptionally high incomes (over $15,000) (Miller, et al., Nye County, Nevada, Information Report, 1976).

No completely reliable data exists for income or employment on smaller-than-county bases. One effort to relate county-wide figures to the Tonopah study area has been made (BLM, Planning Area Analysis, Tonopah Resource Area, 1976). These tentative estimates are incomplete but are suggestive and appear consistent with Census figures for the 1969 agricultural census mentioned above. It is estimated that 40 percent of the approximate 1974 total of 1,500 employees in northern Nye County were employed in mining or in directly related activities. The most important current mining activity is barite. The barite reserves in the Northumberland area yield 10 percent of the total annual United

PRELIMINARY DRAFT

States production. Other minerals produced in the area include turquoise, gold, silver, petroleum, and sand and gravel. In contrast, agricultural employment in the study area is estimated at 58 persons at the time of the 1970 census. This total represents direct employment and misses occasional employees for whom agricultural activities may provide significant supplementary income. It is further estimated that agricultural employment yielded $196,000 of net income (1972), a figure which represents only two percent of the total income for the area.

The impact of agriculture within the study area is greater than these figures suggest. The same study estimates that each employed person supports an additional 1.7 persons (BLM, Planning Area Analysis, Tonopah Resource Area, 1976). Outside of Tonopah, where most northern Nye County governmental service and trade employment is located, the region depends heavily upon primary production from mines and ranches. Both mining and ranching occur mainly on NRL. The products go mainly to markets outside the region, with indirect employment and income effects in those market areas. In consequence, the economic interaction between Tonopah and these primary producers is limited.

Culture and Attitudes: Although mining historically was associated with periods of rapid growth, ranching for more than a century sustained the population of the region and provided an

PRELIMINARY DRAFT

alternative between the mining booms. This past is reflected in the historical sites of mining booms and also in the names on tax records of portions of the private lands which now comprise larger ranches. Although all but 32,440 acres of farm and grazing land are public within the resource area, the tradition has been one of minimal federal regulation. This, in turn, is reflected in a culture of self-reliance and resistance to outside controls. In important respects, this culture predominates whether one is in Tonopah or in a remote agricultural valley. A corollary has been articulated by the state senator for the region, in his campaign for the passage of federal public lands into State and private hands. See Richard Blakemore, "State Can Best Manage Public Domain," Nevada Government Today, Vol. 3, No. 3 (Autumn 1976), pp. 6-8, 28.

On the other hand, the structure of the present economy is also reflected strongly in the regional culture. The clientele served by restaurants and motels is part of the national and state, rather than the local, culture. Government employees and school teachers tend to reflect outside views, and their above average (for the area) purchasing power makes them important customers of local wholesale and retail trade outlets. Although "town people" reflexively tend to side with their rural neighbors in any conflict with outsiders, interviews with a large number of proprietors of trade and service establishments conveyed the minimal nature of rural-town interaction.

PRELIMINARY DRAFT

This suggests an important conclusion: the "modern" culture of Tonopah is development-oriented and outside oriented. Its citizens would like to see much more tourism, especially tourists who are coming to, rather than passing through, the region. Such tourism would mean hunters, fishermen, rockhounds, off-road vehicle enthusiasts, and others whose interests may conflict with those of local ranchers. Ranching families generally express an openness to these "visitors" and a willingness to share public lands with them. However, a major expansion of hunting or fishing would require extensive resource management which would challenge rural patterns. The potential conflict, however, is not articulated and may not be perceived. Town residents also want expansion of mining and related activities. They recognize that growth of opportunities for themselves depends largely upon initiatives beyond their power and their community.

The citizens of the region are proud of their accomplishments in an area with limited potential. They value family harmony and relate such harmony to the smallness of their communities. Many are migrants from other areas, or have returned after living elsewhere. They like and use the region for their recreation. Yet they recognize their dependence on outsiders and express it in indirect fashion -- by distinguishing between the local employees of federal agencies (those who "know and understand" their situation) and anonymous, "unsympathetic" outside supervisors who make the real decisions. They also share a genial

PRELIMINARY DRAFT

fatalism toward the outside world, wondering whether the next problem it makes for them will take the form of new land management regulations, sewerage requirements, or water quality standards.

Ranching in the Tonopah Study Area

For more than a century, the dominant mode of ranching in the area has been the small, family-operated unit. Private lands that served as home base for grazing on NRL have been limited. Day-to-day herd management also has been limited; animals drift seasonally to higher pastures in spring and summer and drift to lower collecting areas in late fall. Control has been accomplished via dependence on developed water supplies and habitual repetition by animals of behavior patterns of previous years. The essentially desert nature of the region means limited forage and low animal-support capability per acre. Greater animal control would require extensive capital investment for fencing and additional water supply development.

It is estimated that ranches in the area employed 58 persons in 1970, with a small decline since then (BLM, Planning Area Analysis, Tonopah Resource Area, 1976). Applying the same estimate as utilized for the larger region (1.7 additional persons supported), the population directly involved in ranching would be 157 persons. No systematic published data on age or sex characteristics of this group exists; however, interviews were conducted with almost half of the ranch operators and their families. It appears that there

PRELIMINARY DRAFT

are relatively few women and children on ranches in the study area. Many ranches are operated by persons who are aging and lack resident heirs to whom property title might be passed.

Limited employment reflects the fact that many operators cooperate with their neighbors during brief peak labor-demand periods. Some larger operators employ additional ranch hands on a regular or a seasonal basis. A number of ranchers also indicated that they supplement ranch incomes through occasional non-ranch employment (in mining, transportation; hay-baling and other opportunities available in the region). Almost all of the paid employees come from the Nye County area. A few persons alternate employment in two or more locations; some members of families are employed elsewhere and return temporarily to assist for brief periods. (Summaries of interviews are coded and on file for examination in the Bureau of Governmental Research, University of Nevada, Reno).

A comprehensive examination of property tax records for ranches in northern Nye County indicates that investment in such forms of real property as houses, barns, and ranch equipment is small. The dominant components of assessed property are cattle and private lands, even though owned acreage in most cases is limited. Not included in such assessment data are substantial investments for developing water supplies on NRL which are integral to existing operations, and the regular maintenance costs these and other facilities entail. However, property records

PRELIMINARY DRAFT

PRELIMINARY DRAFT

reveal that a trend toward ranch consolidation has been underway for a long time. Named, previously independent, ranches have become components of the seemingly more economic scale of units existing today. It is apparent, in short, that the tradition of small family operations is waning. The following categorization of present operations provides further demonstration of this judgment and suggests that some additional consolidation is likely.

TABLE II-46

TONOPAH STUDY AREA CATTLE RANCH OPERATIONS[a/]

Ranch Category	AUMs[b/]	Mean Average Cattle	Mean Average Private Acreage
Large Commercial (3)	20,821	2,013	4,981
Medium-Sized Commercial (3)	10,213	906	3,545
Family/Traditional (8)	1,908	162	390

a/ Data for cattle (cows, heifers, steers over one year) and for private acreage are derived from tax assessment files for Nye County. Figures for AUMs are from Bureau of Land Management (BLM) and do not include U.S. Forest Service AUMs. Categories were constructed from natural breakpoints in the data and named by the principal investigator who took into account interview data provided by ranchers. Limited sheep operations are excluded, as are cattle operations licensed outside the Battle Mountain BLM District. Their inclusion would not significantly affect the data summarized here.

b/ An AUM is defined as the pounds of forage or feed required to sustain an animal unit (one cow or five sheep) for 30 days.

PRELIMINARY DRAFT

It should be recognized that many ranchers also hold grazing permits on U.S. Forest Service lands, and that in some cases these additional permits are crucial to the viability of ranch operations. The general situation, however, is one of marginality (that is, of a continuous threat of economic collapse) for over half of the ranch operations. For these, low beef prices, increased grazing fees, additional capital investment costs, or even the departure of a member of a family can constitute a serious threat to survival of the ranch operation. Though precise ranch-related income figures by category are unavailable, and such income varies sharply with beef prices, the $196,000 estimate for all ranch income in 1972 implies low incomes for Family/Traditional ranch families. This judgment is consistent with observations of homes in the region. These economic facts give particular meaning to the data on grazing fees presented in Table II-47. Grazing fees have increased by more than seven hundred percent since 1962. These increases reflect an established BLM policy of moving toward a fee structure more in line with market values for forage.

Culture and Attitudes: Rising grazing fees, coupled with pressures for reduced grazing and increased herd management, are perceived by many families with long ranching traditions as threats to existing operations. Some blame these factors (and hence the BLM) for the departure of sons or daughters who were expected to maintain the family ranching tradition. While these

PRELIMINARY DRAFT

TABLE II-47

GRAZING FEES ON TAYLOR ACT LANDS[a/]

Year	Fee per AUM[b/]	Year	Fee per AUM
1936-1946	.05	1963-1965	.30
1947-50	.08	1966-1968	.33
1951-1954	.12	1969-1970	.44
1955-1957	.15	1971	.64
1958	.19	1972	.66
1959-1960	.22	1973	.78
1961-1962	.19	1974-1975	1.00
		1976	1.51

a/ William Voight, Jr., Public Grazing Lands, use and misure by Industry and Government Rutgers University Press, New Brunswick, New Jersey, 1976. The 1976 rate was supplied by BLM.

b/ An AUM is defined as the pounds of forage or feed required to sustain an animal unit (one cow or five sheep) for a period of 30 days.

families express some sympathy for the right of outsiders to use national resource lands, they do not expect use by outsiders to increase substantially. At the same time, they do not feel capable of sharing the portion of those lands which provides them with a precarious living. They are bitter and hostile toward outsiders (e.g., wild horse sanctuary enthusiasts and non-resident hunters) who would establish new uses for and new management of what they have used for decades or longer. The

PRELIMINARY DRAFT

isolated existence of these families and their long-established independence and devotion to members of the family are additional aspects of culture relevant to a thorough understanding of attitudes these small ranch operators articulate.

In contrast, operators of medium- and large-sized ranches are both more willing and more able to accommodate already implemented and prospective changes. For them, ranching is a business as much as it is a way of life. Some are more puzzled by current BLM management proposals than they are upset by those proposals. They are willing to accommodate fencing and animal-rotation proposals if those changes promise greater grazing potential in the future. If anything, they wish greater BLM involvement in the form of public investment for improvement of forage and expansion of water supplies. In cultural terms, they are closer to the general attitudes held by businessmen and farmers in the rest of the county than they are to the traditional ranch family attitudes expressed on neighboring operations.

The contrast is between ranching perceived as lifestyle and ranching perceived as a business. These views translate into interesting political perspectives. It is the larger operators who articulate an explicit ideology, using terms such as "free enterprise" and "socialism" in discussing NRL management policies with interviewers. They are uncommitted

PRELIMINARY DRAFT

PRELIMINARY DRAFT

between federal and state management of public lands, though they would like the opportunity of expanding the lands they own. In contrast, the smaller operators articulate a more traditional attachment to the land and to a rural life. Since there has been no tradition of experience with land management by State agencies they doubt that a change of "outside" managers would bring benefits. Though they might be expected to welcome an opportunity to purchase public lands and thereby increase the flexibility of their operations, they express fears regarding any such sales. They fear that sales would involve bids rather than "first options" for long-time residents. Such competitive bids, they believe, would result in corporate land acquisition. If there is any sentiment among small operators for State management of NRL, it is mainly in reaction to recent federal policies and not because they expect a transfer to bring many positive changes.

PRELIMINARY DRAFT

FUTURE ENVIRONMENT

The following section describes the possible future environment of the Tonopah study area by the year 1992 based on established and projected trends, but without implementation of the proposed action. The future environment is analyzed within a 15 year time frame so comparisons can be made of the proposed action which would realize the stated objectives within a like period. Climate and geologic setting, which are not expected to change by the year 1992, are not discussed here because of their minor or negligible role. Resource trends which are described in this section do not necessarily result from the absence of the proposed action. General assumptions used to determine the possible future environment are as follows:

PRELIMINARY DRAFT

1. Livestock numbers on allotments will be adjusted to reflect the two-month rest period and requirements of the Nevada Range Policy. Adjustments will range from 0-100 percent reductions, for a 20 percent reduction overall.

2. No additional Allotment Management Plans (AMPs) will be implemented. There will be an overall vegetative improvement on the two existing allotments with AMPs, but the vegetative resource will decline on allotments without AMPs.

3. There will be a projected increase of 49 percent in population in the Tonopah study area related to increased oil and gas exploration and development.

4. There will be an increase in mineral development with possible reopening of existing mines and additional exploration of prospective areas.

5. Habitat management plans will be implemented for enhancement of wildlife habitat.

6. Wild horse management areas will be established and managed for enhancement of wild horse habitat.

7. Scientific and cultural values will increase in importance for analysis of contemporary problems.

PRELIMINARY DRAFT

Air Quality

Air quality is not expected to change significantly from its present relatively good condition. Increases in road maintenance, agricultural development, and public recreational uses will add small amounts of fugitive dust and vehicle emissions, but not enough to violate State and Federal standards.

Topography

If the proposed action is not implemented, the conditions responsible for the basic character of topographic features would be expected to continue. Unless actions are taken to stabilize the highly erodable soils, more and deeper washes would be cut in the less resistant silt loam sandy soils of the area. These changes would be inconsequential by the year 1992.

The most readily observable change in topography would be expected to occur along some streams such as Cochran Creek, where headcutting (see glossary) and bank and channel erosion would form new channels or realign and deepen old channels. However, these changes would be minor. Any expansion of existing or discovery of new mineral development areas would alter land forms in the immediate vicinity.

Soils

The wide variation in climate, relief (elevations or inequalities of land surface), vegetation, parent materials (soil source materials) and age of landscapes within the study area has resulted in the occurrence of a large

PRELIMINARY DRAFT

number of different kinds of soils. The condition of these soils in future years will reflect directly on existing land management practices.

Areas having allotment management plans (AMPs) would experience increases in vegetative production and would develop relationships between ground cover and soil that favor retention and continued soil development. This would occur only under stable or improving soil conditions for vegetative growth. Soil loss through wind erosion would also trend toward greater losses. (See Soils section earlier in this chapter.) Erosion condition classes representative of the future environment show a potential increase in critical erosion areas. (See Soils section presented in this chapter.) Loss of soil and vegetative cover are only outward or visual signs of damage to the resource. Adverse changes in soil aggregates (flocculation), water/air relationships, and the soil biota would also occur.

Water Resources

Average annual water yields are not expected to change by the year 1992, since they are primarily controlled by climate and geology. Peak runoffs would be expected to increase on areas without Allotment Management Plans (AMPs), while decreases are predicted for the two allotments with implemented AMPs. The chemical quality of both surface and groundwater should be about the same as it now exists.

Future trends of water use are likely to remain much the same, except near Manhattan and Round Mountain where increased water use for mining purposes is probable. Should active mineral exploration programs presently being initiated uncover large economic deposits, increased groundwater usage

PRELIMINARY DRAFT

would probably result. The chemical quality of the groundwater may be a limiting factor in successful groundwater development on a local case-by-case basis. Increased ground cover on AMP areas should improve the conditions that favor groundwater recharge. Relatively poor ground cover on non-AMP areas would tend to have the opposite effect.

Vegetation

Without the proposal, the vegetation in the Tonopah study area would improve on the allotments with implemented AMPs. Areas without AMPs would deteriorate from the present condition. There would be alterations in ground cover, in composition of species making up the ground cover, and in the vigor of the different species.

A study was done as part of the San Luis Watershed Study, New Mexico, on vegetative changes as a response to continuous grazing and summer deferred grazing by livestock. It was found that ground cover decreased under continuous grazing. Under summer deferred grazing, ground cover initially increased then declined over a 14-year period. A shift in dominant grass species occurred over the entire area. It is estimated that neither ground cover nor composition were stable at the conclusion of the study.

Big sagebrush type would change little in aspect (dominant vegetation from outward appearance) but desirable forage grass species would decline and the type (plant community of distinguishable characteristics) would become more open, with an increase in Russian thistle and rabbitbrush.

PRELIMINARY DRAFT

Short grass type would be expected to increase in size, but remain low in vigor. However, there would be a slight increase in vigor from the present. This change would be from a ricegrass dominant to a Galleta grass dominant or co-dominant, and a decrease in winterfat. Halogeton, Russian thistle, and annual weeds would be expected to increase in composition, but change with seasonal precipitation fluctuations. Pinyon-juniper type would not be expected to change in aspect or size.

Shadscale and greasewood type would be expected to change little in size or aspect, but would have a change in composition with an increase in shadscale and greasewood composition or dominancy.

Bunchgrass type would be expected to decrease with the resultant increase in Galleta grass or short grass type.

Even with rest during a two-month grazing period (April-May), livestock habits indicate they will return to the same plants year after year. The more important perennial forage plants would not be permitted to regain vigor, and would slowly decrease with a resultant increase in the more undesirable forage plants.

In the short-run, range trend should show an upward swing, but would then be expected to level off and start a slow decline, or reach an undesirable static trend which is the estimated current (1976) saturation.

PRELIMINARY DRAFT

Annual forb type would be expected to increase in size in the long-term. At present, this type is dominant Russian thistle and halogeton. Although as an aspect or vegetative type the size increase would be slight, the overall composition of this plant species in the other types would increase.

Threatened or endangered species: Information on threatened or endangered species in the study area is scant, so it is impossible to make a definitive statement as to the status of these species 15 years hence.

PRELIMINARY DRAFT

Wildlife

Although most lands support some type of wildlife, the most significant concentrations are found on or near major mountain ranges where precipitation is greatest and food and cover is more abundant. Many of the wildlife species require seasonal use of several vegetal types. Therefore, suitability of one type is strongly influenced by the degree of interspersion with other types, as well as by special features such as streams or "waterholes". One of the more basic land use problems concerning wildlife is the competition for forage between big game animals and livestock.

The following trends would be expected for wildlife and their habitat: 1. decline in overall abundance for most wildlife species occupying the study area, and 2. some species could disappear from specific habitat areas. It is possible, however, that a few species of birds and small mammals would maintain their present populations or even increase in numbers. The direction and extent of wildlife population changes are based on the species and their ability to adapt or resist environmental change.

Conditions expected to influence wildlife populations in the Tonopah study area are: 1. habitat improvements resulting from special wildlife projects developed in Habitat Management Plans (HMPs); 2. Allotment Management Plans (AMPs) already implemented; 3. habitat declines resulting from deterioration of vegetative resources on areas without AMPs; and, 4. mineral development.

PRELIMINARY DRAFT

It is assumed that the eventual implementation of HMPs and wild horse management areas, and forage allocation for reasonable numbers of big game would reduce some of the significant livestock - wildlife competition presently occurring on the key areas, as in the Kawich deer summer range and the Hot Creek winter range.

While big game numbers could be expected to increase initially in response to the reduced livestock numbers, and forage allocation, the assumed long-term result would be competition as it presently exists with overutilization and subsequent forage declines. This overall decline is assumed, despite initial increase in big game numbers, since livestock use would continue much the same as present with habitual use areas such as streams and meadows continuing to be overutilized. This would result in depletion of yearly green-up forage required by livestock and big game. The continued livestock utilization of areas in winter would perpetuate the competition and subsequent decline of quality browse species such as bitterbrush and mountain mahogany.

Big game animals are projected to decline over the long-term in all but a few locations in the grazing area because of a continuing competition for forage among livestock, wild horses, deer, and antelope. It is assumed that reasonable numbers could not be maintained under livestock grazing as would occur without the proposed action, resulting in low populations similar to current numbers. Mule deer use of the Wagon Johnnie, and Willow Creek allotments, under existing AMPs, is assumed to increase by 200 deer as a result of projected forage improvement and reduction of competition through cyclic livestock exclusion from

large areas.

Antelope populations would be expected to maintain present low population levels or possibly decline, despite forage allocations. The present poor range condition and lack of adequate waters as currently exists over many areas of antelope habitat would not be materially improved by reducing livestock numbers by approximately 20 percent. The habitual use by livestock of the valley floor areas is projected to continue the competition among livestock, horses, and antelope.

Reductions in habitat quality would result largely from the area managed as non-AMP allotments, while the small areas of Willow Creek and Wagon Johnnie managed under existing AMPs would result in generally improved habitat.

Game birds would also have population reductions. Among the game birds of the area, sage grouse are in greatest danger of serious population reduction. Much of the existing habitat has been relegated to marginal condition because of the poor rearing and brooding sites, and general overall deterioration of meadow areas this species required. Since their habitat is declining, and is projected to continue declining under livestock use of critical areas, the species may be greatly reduced or could possibly disappear from portions of that historical habitat.

PRELIMINARY DRAFT

Mourning doves, on the other hand, adapt readily to environmental change and are capable of traveling great distances for food and water. Since there is no indication that nesting and roosting habitat would decline, the existing use of the grazing area by mourning doves is not expected to change. In like manner, the present occasional use of the grazing area by waterfowl is not expected to change.

Four furbearers -- the badger, kit fox, gray fox, and red fox -- could possibly expand in numbers as a result of increased rodent populations. While the extent of expansion of these species is dependent upon the degree of competition with coyotes, these furbearers are expected to increase at least 10 percent over existing numbers. Coyote populations are expected to increase as are birds of prey (raptors). Bobcats occupy habitat normally inaccessible by cattle, which should not be affected by their overgrazing. It is likely, however, that some bobcat habitat would be destroyed by mineral exploration and development. The populations of the remaining furbearers of the area -- raccoons, ringtailed cats, and skunks -- would probably remain stable or decline.

Continued yearlong grazing by livestock reduces the vegetation selected by the grazing animals (Hormay, Principles, Rest Rotation, 1970) and allows the pastures to become invaded by brush and shrubs. It is reasonable to conclude, therefore, that the pastures not covered by AMPs would be dominated with such plant species as Russian thistle, rabbitbrush, greasewood, and pinyon-juniper. This increase in brushy cover would influence small mammals. Increase in brushy cover would result in more pinyon mice, deer mice, kangaroo rats, pocket gophers, and rabbits.

PRELIMINARY DRAFT

Such conclusions are substantiated by numerous studies, including Quast (Rodent Habitat Preference, 1954) in California, Phillips (Distribution of Rodents, 1936) in Oklahoma, and Norris (Effects of Rodents, 1950) in New Mexico. This increase in small mammal population would, in turn, influence coyote and birds of prey numbers.

Short grass bird species -- such as meadowlarks, horned larks, and nighthawks -- would decline in numbers, while those species preferring more brushy habitats -- vesper sparrow, sage thrasher, Western bluebirds, and pinyon jays -- would increase in numbers. The overall effect on total numbers of birds in the area would be minimal since the decline in short grass species would be compensated by the increase in birds preferring more brushy habitat. However, the total number of species now found in the area would probably decline.

Current literature offers little data on the effects of livestock grazing programs on reptile and amphibian communities. However, there is no indication that existing populations would change as a result of grazing or any other factor.

Few reports are available on the relationships between invertebrates and grazing; however, vegetative changes would probably influence species composition. Short grass species such as prairie centipedes, mantids, and some species of grasshoppers would probably decline, while aphids, leafhoppers, long-legged flies, and sawflies would probably increase.

PRELIMINARY DRAFT

Aquatic Habitat: The diversion of water from streams for irrigation is common throughout the unit. The stream below the diversion (usually national resource lands) loses part, if not all, its basic productivity at the point of diversion. This practice has reduced or eliminated fish population an undetermined amount in the Tonopah unit.

Sedimentation of streams has been identified as the single most important nonpoint source of pollution in the United States (Environmental Protection Agency, Identifying, Evaluating Pollutants, 1973). Road construction, overgrazing, and mining have all contributed to increased sedimentation of some streams within the unit. Continued sedimentation and other physical habitat changes in the small streams of the Tonopah unit would cause a decrease in the present fish populations.

Under present grazing practices, streams with poor habitat conditions for aquatic life would continue to remain in poor condition. Because the stream is part of the total watershed ecosystem, where watershed conditions deteriorated under expected use, habitat in streams deteriorated also.

Several streams that supported one or more species of trout in 1956-1957 when they were surveyed by the Nevada Department of Fish and Game, support no fish now (1976). The amount of streams miles not capable of supporting fish life will increase by an unknown number under continued present use.

PRELIMINARY DRAFT

Wild Horses

The future environment for wild horses under continuation of present management practices, or "no action", would be similar to that under the proposal, differing only in the extent that management facilities are constructed and in their location. Only construction in herd management areas would impact wild horses. Construction of fences and watering facilities in these areas would impact wild horses just as under the proposal. It is unknown, however, whether construction of facilities in herd management areas will occur and, if so, to what extent.

Implementation of the Nevada Range Policy and Tonopah Management Framework Plan (MFP) decisions would result in adequate forage, water, and space for wild horses. The Herd Use Area Map shows where wild horses would be managed and the optimum numbers.

Management facilities for livestock grazing would result in significant changes in wild horse habitat. Fences would restrict free-roaming behavior and perhaps seasonal movements. Water developments would generally improve habitat and living conditions by providing additional quantities of available water and additional watering places. (See Chapter III - Impacts, for a detailed discussion.) The extent of construction would depend upon the availability of money and manpower. Many facilities could be constructed within 15 years if sufficient money and manpower were made available. If this construction took place, the future environment would be similar to that under the proposal except that no new Allotment Management Plans (rotation grazing systems) would

be in effect. Thus, range conditions over the study area would not greatly improve, except, of course, on two areas with implemented management plans. Wild horses would not have exclusive use of different areas (pastures) each year as they would under the proposal, increasing to some degree competition with cattle for the most desirable forage. The actual impacts of this situation are problematical. Since sufficient forage for each class of livestock would be allocated, the impacts may be insignificant.

If many facilities are constructed, as mentioned above, free-roaming behavior by wild horses as it exists now (1976) would be largely eliminated by fences, though yearlong habitat needs would be met. Water developments would result in improved quality of their habitat in some areas.

Herd management plans would be written for each herd management area, specifying certain management criteria and providing for removal of excess animals. The optimum number for each herd management area would be maintained within the limits set in the MFP (decision WH-2.1-2.8), insuring adequate forage and space as called for in the Nevada Range Policy. The specific management criteria for each management area is, of course, unknown since the plans have not been written.

PRELIMINARY DRAFT

Visual Resources

Railroad Valley will experience accelerated agricultural growth and oil development which, along with human occupation and utility and road construction, would tend to depreciate visual resource quality in that area.

Prospecting, road building, and mining activities would continue to create visual intrusions in presently inactive mineral resource areas.

Generally, the visual environment should improve with implementation of Visual Resource Management (VRM) requirements adopted by the Bureau of Land Management (BLM) and with Management Framework Plan (MFP) decisions which relate to scenic value protection. Morey Peak primitive area and the Six-Mile Back Country use area include about 32,480 acres which would be managed to protect national scenic values. This area would improve in scenic quality after livestock, vehicles, and mining are prohibited under the recreation management plan.

Reductions in livestock stocking, rates, and removal for at least two months as described in the "No Action" alternative would result in overall improvements in vegetative vigor and range appearance. Any range improvements developed in the two implemented Allotment Management Plans (Wagon Johnnie and Willow Creek allotments) or any other new range improvements would conform to VRM Class objectives and the requirements outlined in BLM Manuals 6300, 6310, and 6320.

Cultural Resources

It is assumed that the baseline condition of a cultural resource within the study area is the state in which it was left upon abandonment by its final occupants who utilized that site for a functional purpose. From the time of that abandonment, deterioration occurs through various factors. Some of these factors can be alleviated while others are natural and more difficult to control.

The present condition of the known cultural resources indicates that the following factors are affecting baseline conditions: trampling by domestic livestock, natural erosion through geologic situation, accelerated erosion as a secondary effect of livestock trampling, vandalism, construction of roads (including road grading and bulldozing), management and land use activities which have unintentionally disregarded cultural values (including springs developments, pipelines, powerlines, gravel pits, chainings, etc.), mining activities, other historical activities, hunters and campers, animal burrowing, and animal rubbing.

Cultural properties are nonrenewable and fragile resources. Their condition can be easily disturbed or destroyed, but not readily improved. Continued deterioration of the baseline condition is expected to occur because of several factors. Measures are not available for quantification of this trend. The anticipated influence of these factors includes the following: Without the proposed action, vegetative cover would be expected to decrease, resulting in continued erosion (see the Soils section). Early man sites, campsites, lithic scatters and chipping stations, and quarry sites would be expected to deteriorate through vertical and horizontal displacement of cultural materials, removal and/or redeposition

of natural sediments, and destruction of paleoecological data.Continued erosion may result in complete loss of significant cultural properties.

The study area is expected to undergo an increase in population. Vandalism is currently a major factor in site destruction and would be expected to continue as the population grows. The result would be the loss of significant materials from sites or entire cultural sites.

The increase in population is expected to occur in conjunction with increased interest in minerals, oil and gas, and geothermal exploration. This would result in an increase of surface-disturbing projects resulting from these developments. Protective measures for cultural resources may result from environmental restraints placed on the project. If the energy development proceeds, subsequent loss of cultural resources would occur. This loss may be mitigated in some cases by salvage and scientific study. Net result would be reduction in number of cultural resources. In addition, increased access to cultural resources through exploration activities would expect to increase vandalism.

Without the proposed action, no further Allotment Management Plans would be implemented. The number of projects causing surface disturbance would be expected not to increase. This would result in less disturbance to cultural resource through those activities.

Without the proposed action, livestock numbers would be expected to decrease. Disturbance to cultural resources would be expected to continue because of livestock trampling and secondary livestock-related erosion. The result would be continued damage to artifacts and historical structures, vertical and horizontal

PRELIMINARY DRAFT

displacement, and loss of paleoecological data.

Scientific cultural values will increase in importance for analysis of contempory problems. The study area is expected to be important for research of regional settlement patterns, botanical studies, paleo-environmental studies, historical use and occupation, and subsistence and resource uses of the area. The factors of increased land use and disturbance, vandalism and erosion, with continuation of disturbance by livestock grazing, may totally destroy cultural resources. The reduction in number of cultural resources will restrict the data base and hamper regional research.

PRELIMINARY DRAFT

Land Uses

The population of the Tonopah resource area is projected to increase by 49 percent by 1990, to approximately 4,200 residents. Much of the private land near urbanized communities is undeveloped, and it is possible that much of the projected population increase could be accommodated on available private land.

Demand for recreation and public purpose land transfers for sanitary landfills and recreation sites is expected to increase slightly as populations grow. Sanitary landfills could increase from the four now existing to nine. At least two more applications for recreational developments are anticipated. If potential farmland is developed, there would be additional demands in rural areas for public purpose lands. (BLM, Tonopah Resource Area Analysis, 1976.)

Controls and Constraints

Land within the Tonopah study area is used for a variety of purposes including livestock grazing, minerals, outdoor recreation, fish and wildlife, watershed, and transportation and utility systems. In general, the suitability of land for the various uses overlap and tend to be controlled by physical factors such as soil properties, topography, climate, and vegetation. In some instances conflicts between competing uses of the resources are apparent or imminent. It is expected, therefore, that in the future compromises would be made in land management decisions and practices which would allow optimum concurrent use of the same lands by non-conflicting uses.

The Federal Land Policy and Management Act of 1976 establishes a policy of continued Federal ownership and sets guidelines for administration and management of national resource lands (NRL) by the Bureau of Land Management (BLM).

Some sections of the law also apply to national forest lands administered by the Forest Service of the U.S. Department of Agriculture.

Some of the law's provisions are:

1. Broad management authority under the principles of multiple-use and sustained yield;

2. Authorizes the inventory and identification of the public lands and provides authority for marking and mapping these lands;

3. Calls for comprehensive land use planning;

PRELIMINARY DRAFT

4. Authorizes the use of Land and Water Conservation Fund money to acquire land for proper management of public recreation lands;

5. Authorizes cash payments to equalize values when public lands are exchanged for private lands provided the cash payment does not exceed 25 percent of the total value of the Federal lands involved;

6. Provides for enforcement of public land laws and regulations by Federal personnel or by appropriate local officials who have entered into contracts with the Secretary of the Interior;

7. Provides for distribution of funds collected for grazing fees with 50 percent of all money collected earmarked for range improvements;

8. Authorizes the use of helicopters in administering the Wild Free Roaming Horse and Burro Act;

9. Authorizes loans to state and local governments against their share of anticipated mineral revenues to relieve impacts of mineral development;

10. Requires persons holding mining claims under the general mining law of 1872 to record those claims with the BLM;

11. Authorizes the BLM to carry out wilderness studies on NRL with such studies to be completed within 15 years.

PRELIMINARY DRAFT

Recreation Resources

It is anticipated that outdoor recreation use in the Tonopah study area will become more significant in the future from both a regional and statewide viewpoint. According to Water for Nevada, Volume 7, Water Related Recreation in Nevada, the hydrographic region in which the study area is located is expected to experience an increase in recreation visitor days of 140 percent - between 1970 and 1980. Recreation visitor days in Nye County are projected to increase by 342 percent, based on expectations of the various agencies administering recreation resource lands. This would mean an increase in total visitor days in the study area from the present to a projected visitor days possible by 1990.

Efforts of the Bureau of Land Management (BLM), the U.S. Forest Service, and the Nevada Department of Fish and Game would be directed toward accommodating the anticipated 64 percent increase in angler days by 1980, and toward habitat management for game animal species to maintain the present high quality hunting experience available in the area. As known recreation resources become increasingly popular and receive more pressure, the study area may become one of the "last frontiers" for those seeking relatively uncrowded conditions and a quality hunting experience.

The quality of the natural open space environment should increase as a result of Management Framework Plan (MFP) decisions to withdraw nearly 15,000 acres on Morey Mountain from mineral entry, and to remove livestock grazing from over 32,480 acres in the proposed Morey Peak primitive area

PPELIMINARY DRAFT

and Six-Mile back country use area. Off-road vehicle (ORV) use would be regulated or prohibited in these areas. Also, ORV use would be controlled in some sage grouse strutting and brood-rearing grounds, fragile pond edges, camping areas, and scenic areas, in order to benefit environmental values.

Scenery along with archaeological, historical, and other resource values, would be protected and in some cases, enhanced--by the withdrawal of 280 acres from mineral entry; the closure of Tonopah gem field, Black Rock lava floor, and Easy Chair Crater to mineral sales or leasing; and the establishment of scenic buffer zones around 14 historic sites. (MFP, 1976.)

PRELIMINARY DRAFT

Livestock Grazing

Land suitable for grazing consists of land with suitable soils, useable plant cover and favorable topography to be economically grazed without damaging the resource. Soils vary from shallow to deep with corresponding vegetal types. Some land suitable for range is not presently being utilized because of the lack of water, inaccessibility, or other developmental problems. In general, deteriorated range conditions have resulted in productivity losses. Overuse by domestic livestock, wildlife, and wild horses has resulted in a change of vegetation to less desirable species and in most cases lower yields. In the past use of land unsuitable for grazing because of excessively steep slopes or unstable soil conditions has added to this problem.

While U.S. Department of Agriculture studies project national increases in demand for red meat and AUMs of grazing from 40 to 99 percent by the year 2000, it is highly unlikely that the forage resources in the Tonopah study area could support these increases. Vegetation would be expected to increase initially (see the Vegetation section, presented earlier in this chapter), but decrease in the 15-year period. Domestic livestock use on national resource lands (NRL) would be approximately 20 percent below current licensed use and would be expected to decrease in the future.

In summary, the number of beef cattle, calves, sheep and lambs would be expected to be 20 percent or more below current production. Any livestock increases would be on private lands at the expense of other agricultural activities such as conversion of cropland to rangeland or conversion to livestock feed such as alfalfa and grains.

PRELIMINARY DRAFT

Any increases in livestock numbers would also have to be at the expense of wildlife, wild horses and other land use practices such as recreation, hiking, and sightseeing.

PRELIMINARY DRAFT

Agriculture

Agricultural production on private farms in Big Smoky Valley may increase and diversify from traditional hay crops to grain, field peas, onions, potatoes, and possibly other cool-season crops. Development of national resource lands (NRL) suitable for cultivation is not likely, since the valley has an estimated 92,450 acre-feet of water, while appropriated water rights include 97,687 acre-feet plus on additional 23,106 acre-feet of vested rights. Pipelines or ditches would be needed to bring water from streams such as Peavine, Ophir, Iingston, and South Twin River in order to cultivate NRL.

Railroad Valley would experience new expansion of irrigated cropland with increased use of circular sprinkler system planned on private lands on the east side of the valley. Potatoes may be a primary crop in the future. (Joe Marion, Agricultural Extension Service, personal communication.)

It is estimated that 5,000 acres of NRL in Railroad Valley could be developed for agriculture, if authority for transfer of ownership is granted. The valley could eventually support seven or eight farm operations of between 500-800 acres. It should be noted that a possible future use of groundwater in Railroad Valley could be as a supplemental supply for the Las Vegas metropolitan area, about 150 miles to the south. (BRI Systems - Bureau of Land Management, Agricultural Potential of NRL, 1976.)

Other valleys within the study area where agricultural development might occur are: Monitor Valley (5,000 acres; 5 to 6 farms), Little Smoky Valley (2,125 acres; 2 to 3 farms), and Ralston Valley (1,260 acres; 2 to 3 farms).

PRELIMINARY DRAFT

Mineral Resources

Mineral deposits occur under any topographic feature from stream bottoms to mountain tops. Low grade mineral deposits may occur over large areas.

The selection of land for mineral production is not as flexible as locating land for other uses because mining can only take place where sufficient mineral resources occur. This restrictive geologic and geographic availability often results in land use conflicts and resource conservation problems.

Mining can be one of a sequence of land uses, because deposits are mined over a limited time. Mineral land can be used for grazing, wildlife, outdoor recreation or other uses prior to actual mining. Similarly, land that has been mined can be used for other purposes once mining has been completed. Rehabilitation of mined land will increase with developing technology, the increasing demand for land, and the desire to preserve the quality of the land.

The present mining laws do not require mineral exploration or development activities to compromise. In many instances mining exploration work is done without consideration of other resource values.

It is probable that mining activity would resume in some of the presently inactive mining areas, and that new discoveries of economic mineral deposits would be made with advancement in exploration techniques. With advancement in extraction methods, it is likely mine deposits not now economical would be profitable to mine.

PRELIMINARY DRAFT

Woodland Products

Future demands for firewood are expected to increase commensurate with projected population increases in western Nevada and with a rise in the cost of home heating. Fuel wood sales by both (BLM) and the U.S. Forest Service increased by about 150 percent in 1975 over the five-year average of 1968-1972. Sales are expected to increase about 250 percent by 1980. (BLM, Tonopah Management Framework Plan (MFP), 1976.) Demand for pine nuts is also expected to increase, given the general trends in population growth and family leisure time activities.

Woodland product management objectives in the Tonopah area are to produce a sustained yield of 5,000 posts, 500 Christmas trees, and 200 cords of fuelwood yearly by 1980. No live aspen, ponderosa pine, mountain mahogany, bristlecone pine, or white fir would be harvested on national resource land (NRL). No harvest cutting, except dead material, would be allowed without coordination with the Indian Intertribal Council. Sightseeing features, as identified on the Recreation Resources Map, would be protected against cutting of live trees. The Morey Peak primitive area and six-mile back country area would be closed to harvest of both green wood and deadwood to preserve scenic and aesthetic values. Special attention and care would be given to preserve key pine nut producing areas. (BLM, Tonopah MFP, 1976.)

PRELIMINARY DRAFT

Transportation - Utilities

The suitability of land for transportation and utilities is determined by such criteria as topography, soil bearing strength, and demand. If the demand is great enough, almost any land can be made suitable. Land needed for these purposes would necessarily come from that presently used for other purposes, such as wildlife and recreation. This could cause a chain reaction of land use changes through erosion, barriers, etc., if not properly located and mitigated.

Generally existing highways, roads, and public transportation modes are not expected to change significantly by 1990. Categories of paved and unpaved roads should remain basically the same as today over most of the area. Growth of local populations and increases in highway uses may require upgrading and additional maintenance of major travel routes, as dictated by need and fund availability. No new major road or highway rights-of-way applications are anticipated to affect national resource lands (NRL) in the foreseeable future.

Telephone and electrical distribution lines might be built on an as-needed basis to provide service to Railroad Valley and other residential or agricultural centers. Land corridors might be made available by the Bureau of Land Management for construction of high-voltage electrical transmission lines. The southern portion of the study area is likely to be considered as a possible transmission line route, given the presence of coal reserves in southern Utah, and the energy consuming regions in California.

PRELIMINARY DRAFT

The Arctic natural gas pipeline from the Alaskan north slope to southern California is proposed to pass through Ione Valley, and could require a rights-of-way across more than 40 miles of NRL.

The U.S. Navy has expressed a need for lands in the extreme southern portion of the study area to develop an extensive communications antennae grid. The project is in the early planning stages, and it is not known whether or not formal applications are forthcoming.

PRELIMINARY DRAFT

Social-Economics

The following social-economic conditions for the future environment in the Tonopah study area is based on a 1976 study done for BLM by Dr. M Richard Ganzel of the University of Nevada-Reno.

PRELIMINARY DRAFT

Future Social and Economic Conditions

Future social and economic conditions in the Tonopah study area depend heavily, perhaps even primarily, upon trends in Nevada and in the nation as a whole. These external trends, with the exception of unpredictable demand for and usage of the Nellis Air Force Bombing and Gunnery Range (which includes the ERDA test-site) promise steady, if unspectacular, growth for the study area through the remainder of this century. Less predictable but still promising sources of expanded employment and income opportunities exist within the study area itself. These opportunities depend partly on the implementation of accomodating public policies.

National and State Trends

Four national trends that are well established appear to have definite predictive implications for the future of the Tonopah study area. First, the natural increase of the population has slowed to a rate of less than one percent and has remained at this low level for almost a decade (national trends are summarized and discussed in Renshaw, The End of Progress, 1976). A natural concomitant of this demographic trend is a steady increase in relatively older citizens as a proportion of the entire population. This change, in turn, is reflected in the second important trend, the continuing national migration to southern and western states -- to the Sunbelt. As discussed more fully below, Nevada has been and in the future will continue to be a destination for a significant share of this migration. The third national trend

PRELIMINARY DRAFT

is growing dependence upon imported or less easily accessible natural resources, notably energy resources. The final national factor is continued improvement in standard of living, which promises to expand and sustain the demand for meat produced by grazing on national resource lands. These national trends are translated into projections of rapid population growth for the state of Nevada. These statewide projections, which have a stronger scientific foundation than projections for counties, are presented in Table II-48 Projected Nevada Population. They anticipate a doubling by 1995, to approximately one million residents,

TABLE II-48

PROJECTED NEVADA POPULATION[a/]

	1970 Actual	1980	1990	1995[c/]
Ref. 1	488,738	728,582	931,400	1,008,916
Ref. 2[b/]	488,738	776,000	1,034,000	1,135,500

a/ Chu, S. F. Nevada Population Projection: by County for Selected Years, 1970-2000, University of Nevada, Reno: Bureau of Business and Economic Research, March 1975.

b/ Nevada Division of Water Resources, Water for Nevada: Forecasts for the Future--Population, Carson City: Nevada State Engineer's Office, February 1973.

c/ For both sources, the 1995 estimate represents allocation of projected increases for the decade 1990-2000 equally over the first and second halves of the decade. In other words, the projected gain in population over 1990 is one half of the source's estimated increase for the year 2000.

PRELIMINARY DRAFT

compared to 1970 figures. Although most of these increases will occur in Clark and Washoe counties, Tonopah is situated on U.S. Highway 95. Its already substantial role servicing the needs of pass-through tourists and businessmen will be steadily augmented in future decades. Moreover, as the Las Vegas and Reno metropolitan areas grow, rising demand for meat will increase the pressure upon producers and managers of national resource lands (NRL) to generate more and better quality meat from ranching operations. Expanded feed-lot operations, hay production, and possibly slaughtering businesses serving these growing urban centers will be predictable responses to statewide population expansion. Population growth will also generate increased use of the Tonopah study area for recreation, as the more popular Sierra Nevadas become crowded or as access to park and wilderness areas becomes restricted. Finally, national resource scarcity will mean increased demand for the barite reserves located on the fringe of the Tonopah study area and for other resources located within the study area. Substantial new mining activity is underway in the Round Mountain area. The recent announcement of a petroleum discovery in Railroad Valley, some distance from the producing Eagle Springs Oil Field, has touched off a speculative boom in leases. Intensified exploration of the Tonopah study area for petroleum and other resources is underway.

PRELIMINARY DRAFT

Trends for the Tonopah Study Area

Efforts to project population or income data for counties with a small population, much less for a subsection of a county such as the Tonopah study area, are subject to larger errors. This margin of error is magnified in this case by the extreme variation in federal employees assigned to the Nellis Air Force Bombing and Gunnery Range. Professor Chu has predicted a decline in Nye County population to 5,000 in 1980, followed by a period of complete stability lasting through 1995 (Chu, Nevada Population Projection: by County for Selected Years, 1970-2000, 1975). In contrast, a study by the Nevada Division of Water Resources projects the addition of approximately 1,500 residents per decade for the remainder of the century, or 9,250 residents by 1995. (Nevada Division of Water Resources, Water for Nevada: Forecasts for the Future--Population, 1973).

The most variable factor, federal military and military-related employment, occurs outside the Tonopah study area. In contrast, the factors cited above as stimulants to growth have their primary impact within the study area or on its immediate fringe. The implication is that growth factors predominate for the study area. This conclusion is reinforced by an enumeration of various contemplated, planned, or feasible developments in the study area (for further discussion see BLM, Planning Area Analysis, Tonopah Resource Area, 1976). Proposed projects include a Navy

PRELIMINARY DRAFT

communications project, an Intermountain Power project, and an Alaska Natural Gas Transmission System. The sole current recreation site is at Carver's Station. The need for two more sites during the next 20 years is recognized, but this estimate is on the basis of local population growth figures. The anticipated doubling of Nevada's population suggests that two additional sites will be inadequate to meet forseeable needs, especially if augmented hunting, fishing, and other recreational opportunities receive support from federal and state agencies. It is estimated that 23,045 acres of land suitable for agricultural development are available. (BRI Systems, Inc., Agricultural Potential Of National Resource Lands In The State Of Nevada, 1976.) The study which enumerated these possible developments attempted to translate them into specific population increases by extrapolating past employment ratios and farm sizes into the future. However, if past trends toward farm consolidation continue, and if many new agricultural developments are for hay production, that procedure is dubious. There would be fewer additional farm operations than anticipated. Moreover some labor would be supplied from existing agricultural operations on a part-time or seasonable basis. Such moonlighting, incidentally, might sustain a number of currently marginal ranching operations indefinitely. Finally, some additional harvesting of forest products (firewood, fence posts, Christmas trees) is possible.

The considerations suggest that Professor Chu's projections are almost definitely low. A more realistic Nye County estimate

PRELIMINARY DRAFT

for 1995 would be in the range of 7,500 to 8,500. The three townships of Gabbs, Round Mountain, and Tonopah, which had a combined population of 3,505 (63 percent of the total for Nye County) in 1970, should retain or exceed their current proportion of county population. It should be noted that the city of Gabbs lies outside the region but that the barite mining operations centered there have important employment consequences for the Tonopah study area.

There is no scientific grounds for assuming any major shifts in proportional allocations of employment among occupations during the period, if one assumes that public agencies will accommodate agricultural and recreational developments. If not, the agricultural sector will decline relative to mining, service, and trade sectors. Discovery of substantial new mining (including petroleum) resources, of course, would significantly augment the mining sector. Unfortunately, such discoveries cannot be assumed.

A crucial question is whether the present income situation, in which Nye County income is estimated at 71 percent of the national average (BLM, Socio-Economic Profile, Battle Mountain District, Nevada, 1976), will improve compared with the rest of the country. The answer appears to be negative, with two qualifications noted below. Growth in all sectors of the local economy will be in the form of augmented opportunities, rather than highly profitable new

PRELIMINARY DRAFT

opportunities which would generate sharp increases in income. For example, the expansion of tourism predicted will generate employment at lower income scales. Agricultural development will require substantial capital investment for irrigation, which will lower profitability.

The two opportunities for major increases in income compared to national levels lie in discovery of additional mineral or energy resources or in substantial public investments to improve grazing opportunities on NRL. The first possibility is unpredictable; the second lies beyond the scope of this report.

There is reason to expect some significant attitudinal change within the Tonopah study area over the next two decades. The established trend in which Tonopah residents see themselves increasingly interrelated with national events and tourists will continue. There will be more regular visits by outsiders to rural areas. Finally, ranching and hay operations will be increasingly commercialized, reducing the sense of isolation and some of the defensiveness which are characteristics of present rural attitudes. If vocationally oriented continuing education becomes available locally, such attitudinal changes will accelerate.

PRELIMINARY

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TONOPAH CH. III

PRELIMINARY
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CHAPTER III

ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

ANALYSIS GUIDELINES

This chapter identifies and analyzes impacts of the proposed action. An impact is defined as any change in the existing environment which would be caused by the proposal as outlined in Chapter I, Description of the Proposal. Applicable impacts are identified, analyzed, and traced through the environment as described in Chapter II, Description of the Environment. In instances where an environmental element is expected to remain unchanged by the proposal, i.e., climate, no discussion is given. Impacts discussed are either primary (direct) or secondary (indirect) with short-term or long-term effects.

The major source of environmental impacts are those directly associated with the implementation of the Allotment Management Plans (AMPs) and their separate component parts. Acreage data and source of impacts are summarized in Table III-1, and include the following: 1. Grazing systems. 2. Management facilities, 3. Land treatments.

The "no grazing" component of the proposed grazing management program would result in less, but still identifiable impacts. These areas are also shown in Table III-1.

Through the analysis and with the authors' professional expertise, impacts are quantified. Where facts and previous experience are not available, the authors have used professional judgement to predict what the impacts could be, based on the best available data.

Temporary or short-term impacts are those expected to last less than 15 years; whereas, permanent or long-term impacts are those which would still be evident after project implementation. Localized impacts are those restricted to the immediate vicinity of the action discussed, although actual distance may vary depending on the resource involved.

PRELIMINARY
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TABLE III- 1
ACREAGE DATA FOR SOURCE OF IMPACTS

Allotment	Grazing Systems	Acres Impacted
Monitor	4 pasture rest-rotation	103,580
Francisco	4 pasture deferred rest-rotation	17,331
Wagon Johnnie	4 pasture deferred rest-rotation	125,780
Stone Cabin	4 pasture deferred rest-rotation	170,720
Reveille	4 pasture deferred rest-rotation	619,645
	Sub Total	933,476
Blue Eagle	3 pasture deferred rest-rotation	23,980
Ione	3 pasture deferred rest-rotation	191,099
San Antone-Smoky	3 pasture deferred rest-rotation	1,223,148
Ralston	3 pasture deferred rest-rotation	472,117
	Sub Total	1,910,344
Butterfield	2 pasture deferred rest-rotation	59,800
Hot Creek	2 pasture deferred rest-rotation	156,870
	Sub Total	216,670
Hunts Canyon	4 pasture deferred-rotation	173,597
Darrough Hot Springs	4 pasture deferred-rotation	14,950
Nyala	4 pasture deferred-rotation	324,425
	Sub Total	512,972
Hot Creek	3 pasture deferred-rotation	411,418
Blue Eagle	2 pasture deferred-rotation	20,580
Stone Cabin	2 pasture deferred-rotation	209,885
	Sub Total	230,465
Butterfield	2 pasture deferred	59,800
Willow Creek	2 pasture 3 treatment rest-rotation	49,113
	Sub Total	108,913
	Total Acres Impacted	4,427,838

TABLE III-1
(Continued)
ACREAGE DATA FOR SOURCE OF IMPACTS

Management Facilities a/	Total Number Proposed	Acres Disturbed During Construction (Short-term) b/	Acres Permanently Occupied or Impacted (Long-term) b/
Fences	949 miles	1,725	920
Wells	33	17	6.6
Cattleguards	94	9.4	4.7
Troughs	103	10.3	8.24
Pipelines	157	190	95
Tanks	3	.6	.6
Springs	33	8.3	1.7
Total	--	1,956.0	1,037.0

Allotment	Land Treatments		
	Spray and Seed	Spray	Chain
Hot Creek	10,000		
Stone Cabin	14,200		
Ralston-Monitor	4,900		
Hunts Canyon	3,700	960	
Francisco	1,400	900	
Darrough Hot Springs		1,300	
Ione	2,400		
Willow Creek			2,650
Total Acres	36,600	3,160	2,650

No Grazing Areas a/	Acres Impacted b/
Morey Peak	14,800 for primitive area 17,680 for back country 32,480 Acres

a/ See Table I-1 for break-down by allotment.
b/ National Resource Land (NRL).

ASSUMPTIONS

The following assumptions form the framework within which the impact analysis was made. These are:

1. The proposed allotment management plans (AMPs) would be implemented over an eight year period.

2. Livestock use per period of time would be concentrated in the use pasture for an increased density for each unit area.

3. It is assumed that objectives outlined for each AMP can and would be attained within 15 years after implementation.

4. Wild horse numbers would be reduced to Management Framework Plan (MFP) levels of 520 animals.

5. There would be a two year time lag in revegetation of disturbed sites.

6. The Bureau of Land Management (BLM) would fund improvements and provide manpower to carry out required supervision to insure completion within the eight year time frame, and to provide proper maintenance thereafter.

PRELIMINARY DRAFT

7. The provision of additional waters and management fences would allow use of previously unused, or seldom used areas, by livestock.

8. Adjustments in authorized use, in accordance with Nevada Range Policy and the Tonopah MFP, would result in reductions ranging from 0 to 59 percent for an overall decrease of 22.5 percent in authorized use.

9. Impacts of less than 15 years duration shall be considered short-term, whereas, impacts of more than 15 years shall be considered long-term. Short-term impacts generally coincide with acres disturbed during construction whereas long-term impacts would be associated with acres permanently occupied.

10. The demand for red meat would increase in the future.

11. Existing improvements would be maintained in a serviceable condition.

12. Coordination and agreements would be accomplished as stated in the Tonopah MFP and the AMPs.

13. All proposed facilities, i.e., fences, wells, cattleguards, etc., would be built in accordance with BLM specifications taking into account impacted range users.

14. All spring developments would be fenced to keep out cattle, sheep, and wild horses.

15. Trespass would be uniformly and strictly enforced for all AMPs.

16. "No grazing" areas would be managed for the purposes stated in the Tonopah MFP.

PRELIMINARY
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Topography and Geology

There would be no impacts on topography and geology if the proposal is implemented.

PRELIMINARY
DRAFT

PRELIMINARY DRAFT

Air Quality

Air Quality Impacts

Grazing Systems: Livestock trailing would cause surface disturbance during rotations between pastures. This would result in small amounts of fugitive dust when movements occur, and make compacted driveways vulnerable to increased wind erosion. This impact would be localized and short-term. Intensively utilized pastures would be more susceptible to wind erosion caused by initial overuse of vegetation and livestock concentrations along fence lines, and immediately adjacent to salt and water sources.

Improved vegetative vigor resulting from rest-rotation and deferred-rotation grazing systems would cause a long-term increase in cover, and would cause a net decrease in fugitive dust emissions over time. Fugitive dust emissions would decrease commensurate with the decrease in loss of topsoil because of wind erosion. Studies cited in Investigation of Fugitive Dust-Sources, Emissions and Control (P&DCO - Environmental Specialist, Inc., 1973) indicated that an average of 2.5 percent of the wind erosion soil losses become suspended particulates, for any erodable soil type.

Increases in vegetative cover and ground litter over time would create a build-up of fuel material and increase the probability of larger than normal range fires, and localized, short-term increases in particulate matter (smoke). Numbers of wildfires per year would not necessarily be increased over present levels as a result of

PRELIMINARY DRAFT

fuel build-ups alone. However, the risk of wildfire damage would be higher because of faster rates of spread.

Management Facilities: Construction of range improvement projects would cause temporary disturbance of 1,956 acres, including temporary access routes. Since ground cover will be re-established on disturbed sites after construction, only permanent access roads would be susceptible to wind erosion and subsequent fugitive dust emissions. The total amount of additional dust resulting from construction of range improvements would be offset by reduced wind erosion potential in the long-run, and an overall net decrease in dust.

Construction equipment and vehicles used in initial construction phases would cause temporary increases in carbon monoxide, nitrogen oxides, and hydrocarbons at specific points. Total fugitive dust emissions would depend on the type and number of vehicles involved, wind and moisture conditions, and the duration of construction activity within a susceptible soil type. It should be noted that fugitive dust emissions are indistinguishable from naturally-occurring dust (background) and are often emitted as a result of the same force, i.e., wind erosion. Small amounts of fugitive dust and vehicle emissions would be caused by maintenance and regular inspection of facilities over an indefinite time period.

The presence of permanent maintenance roads and developed water facilities would be expected to attract recreationists and allow

PRELIMINARY DRAFT

the use of recreational vehicles over miles of proposed permanent roads. Vehicular travel would also be expected along fence lines, since temporary construction and maintenance trails would become travel routes where fences form barriers to through traffic. Cumulative negative impacts of management facilities would be negligible, given the size of the study area and the affected airsheds.

Land Treatments: Aerial spraying of the herbicide 2,4-D over 39,760 acres would result in the addition of particulates in the immediate vicinity. Application techniques proposed would reduce the probability of wind drift outside the prescribed spray area. However, fine spray droplets might be carried for short distances regardless of wind conditions. Air quality standards would not be violated by the proposed spraying treatments, since transfer of 2, 4-D through the air reduces and dilutes it to extremely low concentrations. The chemical, when applied according to recommended procedures, is nonpoisonous, nonaccumulative, and noncorrosive. (Heady, Rangeland Management, 1975).

Rangeland drill operationswould add small amounts of fugitive dust during seeding operations, and short-term susceptibility to wind erosion until a grass cover is established.

PRELIMINARY DRAFT

Soils and Water Resources

There is little existing soil and watershed trend data available in the Tonopah study area. Quantification of impacts under these circumstances is difficult necessitating heavy reliance on the intuitive judgements of experts in the field.

Wind Erosion

Wind erosion would be reduced over the long-term by increased total ground cover resulting from implementation of the rest-rotation and deferred rest-rotation grazing systems. Factors influencing the degree of wind erosion are climatic factors (i.e., wind velocity), surface roughness, and vegetative cover.

The cyclic concentration of livestock in use pastures would cause localized short-term increases in soil compaction and wind erosion. This impact on soils would result from initial higher use of vegetation and livestock concentration at water sources. As forage abundance and quality improve, this negative impact would become negligible.

Surface disturbance in localized areas would destroy the surface soil structure (often a vesicular horizon), making those soils more susceptible to wind and water erosion. When the soils re-wet, they

PRELIMINARY DRAFT

often initially break down into a hard, massive microporous crust that greenhouse trials suggest is a poor seed bed (Eckert, et al., Properties Occurrence and Management of Soils, 1976). The soils with vesicular horizons area are especially susceptible to this process are the Aridisols, Torrifluvents, and Torriorthents; they are silty and have low organic matter (Blackburn, et al., Vesicular Horizons, 1975). For susceptibility of soil subgroups to wind erosion, see Appendix D, Table D-2, Soil Interpretations.

According to the Soil Conservation Service (personal communication), it is not possible to quantify wind erosion hazard in the Tonopah study area using presently existing data.

Water Erosion

The steeply-sloping, eroded, sodium-affected and/or dissected phases of the following soil subgroups yield the greatest volume of sediment through water erosion: Lithic Camborthids, Lithic Haplargids, Lithic Torriorthents, Lithic Xeric Haplargids, Lithic Xerollic Haplargids, Duric Natrargids, Durixerollic Natrargids, Xerollic, Natrargids, Xerollic Paleargids, Aridic Argixerolls, Aridic Haploxerolls, Typic Torripsamments, Xeric Torripsamments, Typic Torrifluvents, and Xeric Torrifluvents. Some of these subgroups are more susceptible to erosion because of high clay content and low infiltration rates.

The increased ground cover resulting from the proposed grazing

PRELIMINARY DRAFT

systems would cause a slight decrease in regional sediment yield (a beneficial impact) over the long-run (Hormay, Rest-Rotation, 1970).

The cyclic concentration of livestock in use pastures would cause short-term localized increases in water erosion. This impact would result from initial higher use of vegetation and livestock concentration at water sources. As forage abundance and quality improve, this negative impact would become negligible.

Anticipated ground cover increases would result in greater water retention in soils by reducing overland flow. This long-term beneficial impact of increased soil moisture availability results in increased soil stability and reduced sediment yields. For sediment yield values by soil subgroup for the present and future situation with (or without) the proposal, see Table D-4, Estimated Average Sediment Yield by Soil Subgroup, in Appendix D.

Soil Disturbance from Construction of Management Facilities and Physical Presence of Range Improvement Projects

Range improvement project construction would involve mechanical disturbance of 1,956 acres of soil; 1,037 of these acres would remain in use as a long-term, localized impact. Mechanical disturbance would alter the soil surface, destroying the existing micro-

organism community and vegetation/soil relationship, and affecting the soil moisture regime (the amount of soil water ayailable to plants). Natural drainage patterns would undergo minor diversions in some areas (i.e., at spring developments).

Additional localized soil compaction may be anticipated in range improvement project areas. Expected causes of this compaction would be: 1. livestock and wildlife trampling of soil at fences and water sources, and 2. vehicular travel along incidental access. Soil compaction would cause a decrease in infiltration capacity with resulting increase in overland flow and sediment yield. Because this impact is extremely localized within a much larger area, the cumulative impact is negligible, and therefore, unquantifiable. This impact is partially offset by the effects of frost action (see Climate, Chapter II).

Soil Disturbance from Vegetative Manipulation (Land Treatment)

Vegetative manipulation through land treatments would result in a localized short-term adverse impact of soil disturbance. If the seedings are established, there would be a localized long-term improvement in soil stability (a beneficial impact). Because this beneficial impact is localized in areas totaling about 40,000 acres within a four and a half million-acre area, the cumulatibe impact on soil stability of the study area is considered negligible.

PRELIMINARY DRAFT

Decreased Runoff from Soil Due to Rest-Rotation and Deferred Rest-Rotation Grazing Systems

Improved vegetative vigor resulting from implementation of the grazing management systems would increase overall ground cover and reduce regional runoff from soils by an estimated 10 percent. For natural runoff (without the grazing systems' upgrading of the vegetative cover) of the soil subgroups in the study area, see Table D-2, Soil Interpretations, in Appendix D. The runoff criteria used by the Soil Conservation Service range from "ponded" to "very rapid" and do not have numerical values.

Sediment yields in the study area average less than .2 acre-foot per square mile, indicating that the region has low soil-related runoff values. Since runoff currently presents no problem and is predicted to decrease slightly with implementation of the grazing systems, quantification of soil-related runoff has not yet been attempted for this area. For a list of site-specific impacts on soils and water resources resulting from the proposed action, see Table III-2.

Elimination of grazing on 32,480 acres of national resource land (NRL) in the Hot Creek and Wagon Johnnie allotments would gradually reduce the present sediment yield which averages 0.22 acre-feet per square mile per year from these soil subgroups: 1. Aridic Haploxerolls, 2. Aridic Argixerolls, and 3. Lithic Xerollic Haplargids. The amount of sediment yield reduction would be minor, but cannot be

quantified. This reduction would result from: 1. infiltration rates approaching those rates intrinsic to the soil subgroups which have never been grazed by livestock, 2. overland flow velocities being reduced by increased plant cover, and 3. channels stabilizing.

PRELIMINARY
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TABLE III - 2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		allotment-wide
Blue Eagle						
Pasture W1	Would remain at present levels or decrease slightly due to increase of vegetative cover and litter	Would remain at present levels or decrease slightly due to increase of vegetative cover and litter	Fences: 83 acres short-term (construction); 42 acres long-term Wells: 1.5 acres short-term; 0.5 acre long-term	None	Would remain at present levels or decrease to slow by increasing infiltration due to increase in vegetative cover and litter	Protection of Blue Eagle Springs
Pasture W2	Same as above	Same as above	Troughs: 0.3 acre short-term; 0.2 acre long-term		Same as above	
Pasture 3	Would increase slightly	Would decrease 10-20 percent (erosion class from slight to stable)	Cattleguards: 0.5. acre short-term; 0.25 acre long-term		Would decrease 10-20 percent	
Pasture 1	Would remain at present levels or decrease slightly	Would remain at present levels or decrease slightly			Would remain at present levels or decrease to slow	
Pasture 2	Would decrease slightly	Would decrease 10-20 percent (erosion class from slight to stable)			Would decrease 10-20 percent	

PRELIMINARY
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TABLE III - 2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Reveille						
Pasture 1	Would remain at present levels or decrease slightly due to increase of vegetative cover and litter.	Would remain at present levels or decrease slightly due to increase of vegetative cover and litter	Fences: 286 acres short-term (construction); 143 acres long-term	None	Would remain at present levels or decrease to slow by increasing infiltration due to increase in vegetative cover and litter.	Protection of Twin Springs Slough
Pasture 2	Same as above	Same as above	Wells: 1 acre short-term; 0.3 acre long-term		Same as above	
Pasture 3	Same as above	Same as above	Troughs: 0.4 acre short-term; 0.3 acre long-term		Same as above	
Pasture 4	Same as above	Same as above	Pipelines: 6 acres short-term; 3 acres long-term		Same as above	
			Cattleguards: 0.9 acre short-term; 0.5 acre long-term			

PRELIMINARY
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TABLE III - 2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbances		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Butterfield						
Pasture W1	Would remain at present levels or decrease slightly due to increase of vegetative cover and litter.	Would remain at present levels or decrease slightly due to increase of vegetative cover and litter.	Fences: 85 acres short-term (construction); 43 acres long-term	None	Would remain at present levels or decrease to slow by increasing infiltration due to increase in vegetative cover and litter.	Protection of Lockes Pond and Big Well
Pasture W2	Same as above	Same as above	Springs: 0.7 acre short-term; 0.4 acre long-term		Same as above	
Pasture 1	Same as above	Same as above	Troughs: 0.7 acre short-term; 0.5 acre long-term		Same as above	
Pasture 2	Same as above	Same as above	Pipelines: 1.2 acres short-term; 0.6 acre long-term		Same as above	
			Cattleguards: 0.2 acre short-term; 0.1 acre long-term			

PRELIMINARY
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TABLE III- 2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbances		Soil-Related Runoff	Remarks
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		allotment-wide
Nyala						
Pasture 1	Would remain at present levels or increase slightly*	Would remain at present levels or increase slightly*	Fences: 82 acres short-term; 41 acres long-term Wells: 1.5 acres short-term; 0.5 acre long-term Troughs: 0.3 acre short-term; 0.2 acre long-term Pipelines: 10.2 acres short-term; 5.1 acres long-term Tanks: 0.4 acre short- and long-term Cattleguards: 0.2 acre short-term; 0.1 acre long-term	None	Would remain at present levels or increase to medium due to decreased infiltration	*Grazing System would decrease grass species and increase annuals and shrubs (see Vegetation-Chapter III)
Pasture 2	Same as above	Same as above			Same as above	
Pasture 3	Same as above	Same as above			Same as above	
Pasture 4	Same as above	Same as above			Same as above	

PRELIMINARY
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TABLE III - 2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Ione						
Pasture 1	Would remain the same or decrease slightly over the long-term	Would remain the same or decrease slightly over the long-term	Fences: 176 acres short-term; 88 acres long-term Wells: 3 acres short-term; 1 acre long-term Springs: 0.2 acre short-term; 0.1 acre long-term	Pasture 1- 2400 acres spray and seed: slight short-term increase in erosion until grass species become established; long-term decrease in erosion	Would remain the same or decrease to slow over the long-term due to increased infiltration	
Pasture 2	Would decrease due to increased ground cover. Soil surface factor in the southern part of Ione Wash would be reduced from 67 to 40 (critical to slight)	Would decrease due to increased ground cover. Soil surface factor in the southern part of Ione Wash would be reduced from 67 to 40 (critical to slight)	Troughs: 1.3 acres short-term; 1 acre long-term Pipelines: 16 acres short-term; 8 acres long-term Cattleguards: 1.1 acres short-term; 0.6 acre long-term		Reduce runoff from very rapid to medium by increasing infiltration and vegetative cover	
Pasture 3	Same as for Pasture 1	Same as for Pasture 1			Would remain the same or decrease to slow by increasing infiltration	

PRELIMINARY
DRAFT

PRELIMINARY DRAFT

TABLE III - 2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbances		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Francisco						
Pasture 1	Would remain the same	Would remain the same	Fences: 24 acres short-term, 12 acres long-term Wells: 0.5 acre short-term; 0.2 acre long-term Tanks: 0.2 acre short and long-term Springs: 0.2 acre short-term; 0.1 acre long-term Troughs: 0.5 acre short-term; less than 0.5 acre long-term Pipelines: 7 acres short-term; 4 acres long-term Cattleguards: 0.4 acre short-term; 0.2 acre long-term	Pasture 3- 1400 acres spray and seed: short-term increase in erosion until seeding is established; long-term decrease in erosion. 900 acres spray only: erosion would remain at present levels or increase slightly until grass composition increases; long-term decrease in erosion.	Would remain the same	
Pasture 2	Would decrease by reducing soil surface factor and increasing litter and ground cover	Would decrease by reducing soil surface factor and increasing litter and ground cover			Would decrease because of increase in infiltration due to increased ground cover and litter.	
Pasture 3	Would decrease by reducing soil surface factor due to change in ground cover composition	Would decrease by reducing soil surface factor due to change in ground cover composition			Would decrease because of increase in infiltration due to change in ground cover composition	
Pasture 4	Would decrease by reducing soil surface factor and increasing ground cover and litter	Would decrease by reducing soil surface factor and increasing ground cover and litter			Would decrease because of increase in infiltration due to increased ground cover and litter	

PRELIMINARY
DRAFT

TABLE III - 2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
San Antone-Smoky						
Pasture 1	Would decrease slightly by reducing soil surface factor from over 50 to less than 40 by increasing ground cover	Would decrease slightly by reducing soil surface factor from over 50 to less than 40 by increasing ground cover	Fence: 284 acres short-term; 142 acres long-term Wells: 3 acres short-term; 0.8 acre long-term	None	Would decrease from rapid to slow or medium by increasing infiltration due to increase in ground cover	Soil surface factor would be reduced from over 50 to 40 on 640, 600 acres within 15 years.
Pasture 2	Same as above	Same as above	Springs: 0.3 acre short-term; 0.2 acre long-term		Same as above	
Pasture 3	Same as above	Same as above	Troughs: 1 acre short-term; 0.9 acre long-term Pipelines: 35 acres short-term; 18 acres long-term Cattleguards: 0.8 acre short-term; 0.4 acre long-term		Same as above	

PRELIMINARY
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PRELIMINARY

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TABLE III - 2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Stone Cabin						
Pasture 1	Would remain the same or decrease slightly by increasing vegetative cover and litter	Would remain the same or decrease slightly by increasing vegetative cover and litter	Fences: 174 acres short-term; 87 acres long-term Wells: 1 acre short-term; 0.3 acre long-term Springs: 0.3 acre short-term; 0.2 acre long-term Troughs: 0.9 acre short-term; 0.7 acre long-term	Pastures 5 and 6: 14,200 total acres spray and seed-would caused a short-term soil disturbance and slight increase in erosion until seedings are established; erosion would decrease over the long-term due to increased vegetative cover and litter	Would remain at present levels or decrease to slow by increasing infiltration due to increase in vegetative cover and litter	
Pasture 2	Same as above	Same as above	Pipelines: 21 acres short-term; 11 acres long-term		Same as above	
Pasture 3	Same as above	Same as above	Cattleguards: 1 acre short-term; 0.6 acre long-term		Same as above	
Pasture 4	Same as above	Same as above			Same as above	
Pasture 5	Same as above	Same as above			Same as above	
Pasture 6	Same as above	Same as above			Same as above	

PRELIMINARY

DRAFT

TABLE III -2
SITE-SPECIFIC IMPACTS ON SOIL AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Hunts Canyon						
Pasture 1	Would remain the same or increase slightly*	Would remain the same or increase slightly*	Fences: 34 acres short-term; 17 acres long-term Wells: 0.5 acre short-term; 0.2 acre long-term Springs: 0.2 acre short-term; 0.1 acre long-term	Pasture 3- 3700 acres spray and seed and 960 acres spray only: would cause temporary soil disturbance; short-term impact be increased soil erosion until seeding is established; immediately after seeding is established, erosion would decrease; after grazing system is implemented on the seeding area, erosion would increase over the long-term (see Vegetation, Chapter III)	Would remain at present levels or increase to medium due to decreased infiltration	*Grazing System would decrease grass species and increase annuals and shrubs (see Vegetation-Chapter III)
Pasture 2	Same as above	Same as above	Troughs: 0.7 short-term; 0.5 acre long-term		Same as above	
Pasture 3	Same as above	Same as above	Pipelines: 13 acres short-term; 7 acres long-term		Same as above	
Pasture 4	Same as above	Same as above	Cattleguards: 0.2 acre short-term; 0.1 acre long-term		Same as above	

PRELIMINARY DRAFT

TABLE III -2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Wagon Johnnie						
Pasture 1	Would decrease an estimated 20% in that portion of Pasture 1 that currently lies in a critical erosion class area (erosion class would change from critical to moderate)	Would decrease an estimated 20% in that portion of Pasture 1 that currently lies in a critical erosion class area (erosion class would change from critical to moderate)	Fences: 40 acres short-term; 20 acres long-term Springs: 0.4 acre short-term; 0.2 acre long-term Troughs: 0.6 acre short-term; 0.5 acre long-term Pipelines: 13 acres short-term; 7 acres long-term	None	Would decrease by increasing infiltration due to increase of vegetative cover and litter	The soil surface factor on 1,047 acres of critical watershed encompassing portions of Pastures 1,4, and 5 would be reduced from 80 to 45
Pasture 2	Would remain at present levels or decrease slightly due to increase in vegetative cover and litter	Would remain at present levels or decrease slightly due to increase in vegetative cover and litter	Cattleguards: 0.1 acre short-term; less than 0.1 acre long-term		Would remain at present levels or decrease to slow by increasing infiltration due to increase of vegetative cover and litter	
Pasture 3	Same as for Pasture 2	Same as for Pasture 2			Same as for Pasture 2	
Pasture 4	Same as for Pasture 1	Same as for Pasture 1			Same as for Pasture 1	
Pasture 5	Same as for Pasture 1	Same as for Pasture 1			Same as for Pasture 1	

PRELIMINARY DRAFT

TABLE III-2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Darrough Hot Springs						
Pasture 1	Would remain the same or increase slightly*	Would remain the same or increase slightly*	Fences: 57 acres short-term; 29 acres long-term Wells: 1 acre short-term; 0.3 acre long-term Springs: 0.2 acre short-term; 0.1 acre long-term Troughs: 0.6 acre short-term; 0.5 acre long-term	The proposed brush spraying of 1300 acres would probably not disturb the soil surface because grass species would replace the brush (there may be increased susceptibility to wind erosion until grass takes hold).	Would remain at present levels or increase to medium by decreasing infiltration	*Grazing System would decrease grass species and increase annuals and shrubs (see Vegetation-Chapter III)
Pasture 2	Same as above	Same as above	Pipelines: 5 acres short-term; 3 acres long-term		Same as above	
Pasture 3	Same as above	Same as above	Cattleguards: 0.3 acre short-term; 0.2 acre long-term		Same as above	
Pasture 4	Same as above	Same as above			Same as above	

PRELIMINARY

DRAFT

TABLE III -2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Hot Creek						
Pasture 1	Would remain at present levels or increase slightly*	Would remain at present levels or increase slightly*	Fences: 228 acres short-term; 114 acres long-term Wells: 2.5 acres short-term; 0.8 acre long-term Springs: 0.4 acre short-term; 0.2 acre long-term	Pasture 1- 10,000 acres spray and seed: would cause temporary soil disturbance; short-term impact would be increased soil erosion until seeding is established; immediately after seeding is established, erosion would decrease; after grazing system is implemented on the seeding area, erosion would increase over the long-term (see Vegetation-Chapter III)	Would remain at present levels or increase to medium due to decreased infiltration	*Grazing System would decrease grass species and increase annuals and shrubs (see Vegetation-Chapter III)
Pasture 2	Same as above	Same as above	Troughs: 1.1 acre short-term; 1 acre long-term		Same as above	
Pasture 3	Same as above	Same as above	Pipelines: 20 acres short-term; 10 acres long-term		Same as above	
Pasture 4	Same as above	Same as above	Cattleguards: 0.9 acre short-term; 0.5 acre long-term		Same as above	
Pasture 5	Same as above	Same as above			Same as above	

PRELIMINARY DRAFT

TABLE III -2
SITE-SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks allotment-wide
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		
Ralston-Monitor						
Monitor Pasture 1	Would remain the same or decrease slightly by increasing vegetative cover and litter	Would remain the same or decrease slightly by increasing vegetative cover and litter	Fences: 335 acres short-term; 168 acres long-term Wells: 1.5 acres short-term; 0.5 acre long-term Springs: 0.1 acre short-term; less than 0.1 acre long-term Troughs: 1.3 acres short-term; 1 acre long-term	Monitor Pastures 1,2, and 3: 4900 acres spray and seed: short-term soil disturbance and slight erosion increase until seedings are established; erosion would decrease over long-term due to increased vegetative cover and litter	Would remain the same or decrease to slow by increasing infiltration due to increase in vegetative cover and litter	Water quality conditions in Pine, Corcoran, and Mosquito Creeks should improve
Pasture 2	Same as above	Same as above	Pipelines: 34 acres short-term; 17 acres long-term		Same as above	
Pasture 3	Same as above	Same as above	Cattleguards: 3 acres short-term; 1.5 acres long-term		Same as above	
Pasture 4	Same as above	Same as above			Same as above	
Ralston Pasture 1	Same as above	Same as above			Same as above	
Pasture 2	Same as above	Same as above			Same as above	
Pasture 3	Same as above	Same as above			Same as above	

PRELIMINARY DRAFT

TABLE III - 2
SITE- SPECIFIC IMPACTS ON SOILS AND WATER RESOURCE
RESULTING FROM THE PROPOSED ACTION

Allotment	Grazing Management System		Soil Disturbance		Soil-Related Runoff	Remarks
	Wind Erosion	Water Erosion	Management Facilities allotment-wide	Land Treatment Measures		allotment-wide
Willow Springs						
Pasture 1	Would remain at present levels or decrease slightly due to increased ground cover	Would remain at present levels or decrease slightly due to increased ground cover	Fences: 9 acres short-term; 5 acres long-term Springs: 0.2 acre short-term; 0.1 acre long-term Troughs: 0.6 acre short-term; 0.5 acre long-term		Would remain the same or decrease to slow or medium due to increased infiltration and ground cover	Reduce stream channel erosion on Willow Creek by usage of far fewer AUM's than are available and the 3-treatment rest-rotation system
Pasture 2	Same as above	Same as above	Pipelines: 7.2 acres short-term; 3.6 acres long-term		Same as above	

PRELIMINARY
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Groundwater Withdrawal

Thirty-three new wells are planned for the study area to provide better water distribution for animal use. It is unlikely that any measurable amounts of additional groundwater would be withdrawn from the groundwater reservoirs over and above the present withdrawal rates. Already-existing wells would probably produce less water after the new wells begin production since the overall stockwater requirements would not be increasing. (For the number of new wells to be drilled per allotment, see Table I-1, Proposed Action.)

The wells would operate long enough to keep the water tanks full and would then be shut off for periods of time. Assuming the wells would be pumping an average of five gallons per minute for 12 hours a day yearlong, 33 wells could withdraw 133 acre-feet of water from the goundwater reservoirs. This groundwater production would be divided among the numerous groundwater basins of the study area. When compared to the combined annual yield of the hydrographic basins, a 133 acre-foot loss (should it occur) would not be measurable. (For annual yield and groundwater storage data, see Water Resources, Chapter II).

PRELIMINARY
DRAFT

Water Quality

Implementation of the proposed action would cause a minor long-term improvement in regional water quality as explained below. This regional beneficial impact cannot be quantified with existing data. Any change in quality would have no effect upon surface water usage. Groundwater quality would not be impacted by the proposed action. All the perennial streams (except for Six Mile Creek in the Hot Creek allotment) flowing into the study area originate on national forest lands. The resultant water quality is, therefore, largely dictated by conditions and practices on the national forest lands.

Implementation of grazing management systems and land treatments would increase vegetative vigor and ground cover, resulting in less erosion and subsequent reduction in overall sediment yield. Since reduced sediment loads would provide less opportunity for soil salts to dissolve, the chemical quality of surface waters should improve slightly. This long-term beneficial impact on chemical quality cannot be quantified on a regional basis with existing data. The total dissolved solids should not, however, change much on a regional basis since the water would still interact with the same geologic parent material and soils that are providing the dissolved solids and stream flow, regardless of

PRELIMINARY DRAFT

whether or not the proposal is implemented. Since runoff is determined by climatic factors, it would not be affected by the proposal. The regional surface water supply would not change. Surface water supplies would not be increased or reduced by the proposal; water quality chemical constituents would not be diluted or concentrated beyond present levels. The quantification that follows is derived from Bureau of Land Management, Nevada State Office expertise.

The fecal streptococcus, phosphate, and nitrate concentrations should decrease at proposed spring developments by an estimated 80-90 percent. They would be fenced 100 feet from their wet area peripheries, thus protecting them from cattle contamination. This would be a beneficial impact realized over the short-term.

Surface waters would be impacted by implementation of the proposed action. The level of impacts follow:

Hot Creek Allotment: Six Mile Creek in the Hot Creek allotment would be excluded from grazing, and the canyon mouth would be fenced. There would be an estimated 80-90 percent decrease in fecal streptococcus, phosphate, and nitrate concentrations over the short-term. The nutrient levels would decrease immediately, and water temperature would gradually decrease as vegetation grew back to establish a canopy over the stream bank. As a result, an

assumed long-term improvement would occur.

Ralston-Monitor Allotment: Meadow Creek, Mosquito Creek, Corcoran Canyon Creek, and Pine Creek in the Ralston-Monitor allotment should have a reduction in turbidity levels with improved watershed conditions. The grazing system would provide a short season of use later in the year (7/1 to 10/15). Although the cattle would be more concentrated, they would be on the pastures a shorter period of time than at present, thus resulting in a net improvement in water quality.

San Antone-Smoky Allotment: Shipley Creek and Moore's Creek in the San Antone-Big Smoky allotment (the Manhattan pasture) would have a long-term improvement in water quality through a reduction (an estimated 25 percent) of presently high nutrient concentrations. This would occur as a result of decreased cattle numbers and decreased pasture use (shorter grazing periods). Peavine Creek in the San Antone-Big Smoky allotment flows along the boundary between the Cloverdale and Manhattan pastures. A pasture fence would be built up the canyon between the pastures. Cattle would be in the Cloverdale pasture from November 1 to February 28 and in the Manhattan pasture from March 1 to June 30, with cattle tending to congregate near the fence for the entire six months. Since Peavine Creek would have nutrients draining into it during the use period for each pasture, fecal streptococcus, nitrate, and phosphate concentrations could be expected to increase by an estimated 50 percent from present levels.

Wagon Johnnie Allotment: Danyille Creek and Clear Creek in the Wagon Johnnie allotment would have an approximate 25 percent increase in concentrations of fecal streptococcus, nitrates, and phosphates as a result of increased cattle numbers.

Two water bodies--Echo Canyon Reservoir (in the Reveille allotment) and Little Fish Lake--currently show poor quality waters (see Water Quality Table in Chapter II). This condition would continue or worsen because of natural causes, irrespective of the proposed action.

There should be no impacts on the water quality of surface waters resulting from spraying procedures if BLM manual procedures are followed when spraying is done.

For additional information on water quality impacts, see the Aquatic Habitat section of Chapter III.

PRELIMINARY
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Summary

Due primarily to an increase in ground cover, the following would occur:

1. Regional long-term decrease in wind erosion,
2. Regional long-term decrease in water erosion,
3. Regional long-term increase in water infiltration rate,
4. Regional maintenance or improvement of water quality, and
5. Regional long-term reduction in soil-related runoff.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Vegetation

General Impacts

The ideas prevail that overstocking is the main cause of range deterioration and that range improvement can be accomplished by proper use of vegetation through only proper stocking. These ideas are incorrect because of the grazing habits of animals.

Livestock and wildlife in general graze selectively and keep returning to the same plants year after year. If yearlong grazing is the system they may return to the same plant several times during the year.

If the pattern of use is the same each year, uncontrolled season-long grazing under light stocking levels means some plants will gradually be destroyed. Unfortunately these plants are usually the more desirable perennial native range plants. If these more desirable plants are destroyed two things can happen: 1. the space is occupied by less desirable perennials or 2. the space is occupied by annuals.

Impacts on vegetation vary depending upon the number, kind of animal grazing, season of use, and how the animals are distributed. Plants are impacted more when grazed during the early growth period. The early growth period is when plants draw heavily from the preceeding year's carbohydrate reserves. After a period of sufficient growth, carbohydrates are synthesized from the leaf area in sufficient quantity to continue growth and eventually to add back depleted

PRELIMINARY DRAFT

reserve storage. Grazing or removal of green leaf material during the early growth period necessiates a plant drawing on stored reserves for continued growth. This continual draw on stored reserves reduces the capacity of a plant to produce growth and to produce seed. If continued, vigor decreases and the plant may eventually die.

The time periods for growth are different for each plant species. Table I-3, Plant Phenology, shows the general dates for the more important forage species in the Tonopah study area. These growth dates will vary somewhat according to yearly fluctuations in climate and/or topography within the study area.

Grazing during the early growth period will also have an impact on any new plant seedlings. Young seedlings can be pulled up before they have an opportunity to develop a substantial root system. Removal of leaves of the plant anytime during the green period reduces the amount of carbohydrates a plant can manufacture and store as reserves. Grazing or removal of plant materials are less critical later in the growth period. Approximately 90 percent of a plant's food reserves have been restored by seed ripe time. Illustration III- 1 shows the shoot growth and reserves of Idaho fescue (Hormay and Talbot, Rest-Rotation Grazing, 1961).

PRELIMINARY
DRAFT

Illustration III-I . Trend in carbohydrate reserves in relation to shoot growth. Shoot growth of Idaho fescue and based on data by Hormay and Talbot, (Rest-Rotation Grazing, 1961). Carbohydrate curve, based on data by McCarty and Price, (Growth and Carbohydrate Content, 1951), is related to curve of Idaho fescue by plant growth stages.

In woody (browse) plants reserves are stored mostly in growing points which are exposed to grazing. This means grazing during plant dormancy on browse plants can be harmful.

Some plants can withstand more grazing than other. The combined yield of initial growth and regrowth from plants grazed early in the growing season is less than the total yield from ungrazed plants.

Some vegetation could be physically damaged or destroyed by trampling. To a large extent this is dependent on the number of animals per given area and on the tendency of animals to go to the same area year after year. It is doubtful because of the large pasture sizes in the Tonopah study area, that this characteristic in animals would have a significant impact on vegetation overall.

Livestock trampling on some soils during wet periods may compact the soils which in turn restricts root growth and infiltration of water for plant growth. Studies available on the trampling effects of livestock on arid land soils, show little difference in compaction (Daubenmire and Colwell, Overgrazing, 1942; Meeuwig, Effects of Seeding, 1965; Laycock and Conrad, Grazing Soil Compaction, 1967).

Ratliff et al. (Grazing at Harvey Valley, 1972) also indicates that there were no differences in bulk densities (compaction) between a season-long grazing area and rest-rotation grazing area in the spring, but the rest-rotation plots were less compacted in the fall. It is stated that apparently frost action tends to break up compacted sites. This phenomenon is further substantiated by Sharp et al. (Twenty-Second Annual Report, 1971).

In Appendix A, four tables and corresponding maps depict the proposed grazing season by pasture for each allotment for years one through four. Tables A-1 to A-4 show Animal Unit Months (AUMs) available and used by season, the livestock AUMs available through the range survey and the livestock AUMs to be utilized, by season for each pasture. Chapter I, Proposed Action, describes the typical grazing systems as presented here.

In the first year 1,113,370 acres would be grazed by livestock during the critical growing period (April 1 to June 15). This acreage covers approximately 25 percent of the study area.

PRELIMINARY DRAFT

Although livestock numbers would be reduced under the proposal, the number of animals per given area (density) would increase. Concentration of livestock would result in areas being grazed that previously had little or no grazing.

Cattle are selective animals and grasses are usually the most important constituent in their diets. Browse seldom exceeds 20 percent of cattle or sheep diets unless grass is extremely limited (Theurer, et al., Botanical Composition of Diets, 1976).

Lesperance et al. (Symposium on Pasture Methods, 1970) in northern Nevada showed approximately 83 percent of cattle's diets was grass even though less than 15 percent of the vegetative cover consisted of grass. These studies show thesmall amount of browse consumed (nine percent) was largely bitterbrush. The study had a season of use of May through November on a sagebrush, grass vegetative type.

All rest systems would allow plants to rest from livestock grazing during a complete growing cycle. Thus, plants would be provided the opportunity to store food reserves, regain vigor, and produce seed. The only exception to this is bitterbrush which produce seed only on two-year-old growth.

PRELIMINARY DRAFT

Impacts by System: Impacts to vegetation that can be expected under the proposed systems are as follows:

Four Pasture Rest-Rotation System: There is only one true rest-rotation system in the study area. This is the Monitor portion of the Ralston-Monitor Allotment Management Plan (AMP) which encompasses 103,580 acres or approximately 2.3 percent of the study area. The season of use is July 1 to October 15, by cattle.

The plant phenology for this area shows that all of the key species of grass plants have reached their peak of flowering and several have reached seed-ripe before livestock grazing starts on July 1. Under this grazing system grasses have restored at least 90 percent of their reserves before livestock grazing is allowed.

Treatment A (9/10 to 10/15) defers grazing until September 10. This allows all plants to produce food reserves to at least the 90 percent level and most plants to a 100 percent level. It also allows for seed trampling. One shortcoming of this treatment is the competition between deer and cattle. During this time period cattle would eat more browse than during the spring and summer months, regardless of the small amount. This would be especially true on bitterbrush which is a highly desirable plant for deer in winter because of its high nutritive value. This impact would not be completely detrimental, however, as light cattle use on bitterbrush shapes the bush in such a manner that more of the twigs are

PRELIMINARY DRAFT

available. It would also stimulate succulent new growth. It must be kept in mind, however, that bitterbrush only produces seed on second year growth and must be rested. This rest is not always possible under concentrated deer winter use. This treatment (9/10 to 10/15) would occur only one out of four years. For further discussion on this subject see Wildlife impacts in this chapter.

Treatment B provides for a season-long rest from livestock grazing. This treatment (rest) following treatment A above (9/10 to 10/15 grazing) would allow all plants to restore 100 percent of food reserves, maintain vigor, grow, produce seed, allow litter to accumulate, and provide for initial seedling establishment.

Treatment C (8/8 to 9/10) would allow the majority of the plants to grow, produce 90 percent food reserves, allow seedlings to become well established, and increase total volume of forage. The majority of grass species would restore 100 percent of their food reserves and produce seed which could be trampled in by livestock.

Treatment D (7/1 to 8/5), although being the earliest grazing period on the allotment, is late enough to allow all the key grass species to reach their peak of flowering as described at the beginning of this allotment impact discussion.

Overall, this system is highly oriented to grass production. The "aspect" in 20 years would show a definite aspect change toward grass as well as a total volume increase.

PRELIMINARY DRAFT

Four Pasture Deferred-Rest Rotation: There are 937,616 acres of the study area under this system which amounts to approximately 21 percent of the Tonopah study area. There are four allotments under deferred rest-rotation: Reveille allotment (619,645 acres), Francisco allotment (17,331 acres), Wagon Johnnie allotment (129,920 acres), and four pastures of the Stone Cabin allotment (170,720 acres).

Reveille and Franciso allotments have a proposed season-long grazing period for cattle only. Their grazing formulas differ only by one month in summer season. Both proposals provide a season-long rest period.

Treatment A (spring use) would result in utilization of plants at the start of the growing period until at least seed-ripe of the majority of the grass plants. In the first year this would reduce the vigor of the plants grazed by reducing food reserves. In the following year, however, these pastures would be allowed to grow through the time period required to restore at least 90 percent of their food reserves and to produce seed.

Treatment B (summer use) would allow plants to grow through seed-ripe or seed dissemination of the majority of the grass species before livestock are allowed to graze. Grazing by livestock after seed is produced would allow trampling of seed, maintenance of vigor, and production of litter. This treatment followed by winter use (Treatment C) would allow seed production, vigor, litter accumulation, and seedling establishment.

Treatment C (winter) allows major forage species to complete a growing cycle and the key browse specie, winterfat, to set ripe-seed. It is during this period that cattle would utilize more of the browse species.

Treatment D (yearlong rest) would allow plants to complete an entire life cycle without livestock use. This would allow an increase in litter accumulation; all plants could restore vigor and produce seed.

Generally the four pasture deferred-rest rotation grazing system on the Reveille and Francisco allotments is keyed on Indian ricegrass and winterfat. There is competition with deer use in pasture 1 on the Francisco allotment in winter and early spring. This pasture would be slower in responding to the treatments because of use of vegetation during the periods rested from livestock use (see Wildlife section). This problem with competition should be recognized especially in view of the 52 Animal Unit Months (AUMs) deficiency noted in the allotment management plan (AMP). In Reveille a similar situation exists for pasture 1 where 200 horses would be allowed yearlong. This pasture would be slower than the other three responding to the proposed grazing system. A small amount of competition between cattle and deer would also exist in pasture 1. This competition factor would be small, however, because of the steepness of the area. Although this deer area was shown as deficient by 146 AUMs, the major competition in the past was from wild horse use, which would continue to have an impact on the vegetation when coupled with cattle use.

PRELIMINARY DRAFT

The other two allotments under deferred-rest rotation are Stone Cabin allotment (170,720 acres), and Wagon Johnnie allotment (129,920 acres). The difference between these two allotment systems is the early grazing period (treatment A). Stone Cabin's early grazing period starts April 10, while Wagon Johnnie's starts May 1. Stone Cabin's Treatment B grazing period starts May 10; Wagon Johnnie's starts June 15. Although these two systems differ only by 20 days in the spring and 15 days in the fall, the change in use periods between pastures is significant enough that each system will be analyzed separately.

Wagon Johnnie's treatment A consists of grazing by livestock (cattle only) between May 1 and June 15. In the first year this treatment would reduce plant vigor and litter. However, this treatment follow treatment D (Rest yearlong) after the first year.

Treatment B (6/15 to 7/30) would allow most of the native grass species to restore 90 percent of their food reserves and would allow crested wheat to produce seed and to be trampled.

Treatment C (8/1 to 9/15) would allow initial seedling establishment, allow all key grass plants to restore food reserves, produce seed, and increase litter. Some seed would be trampled.

Treatment D (rest yearlong) would allow all plants to rest yearlong from livestock grazing. This treatment followed by spring grazing would provide livestock with an increase in forage volume, an

increase in vigor, production of seed, and one full year of seedling establishment.

It should be noted out that although wild horses would be reduced to 35 head, the continued grazing of these animals would have an impact on reducing plant vigor obtained through livestock grazing.

There are two perennial streams in the Wagon Johnnie allotment (Clear Creek and Danville Creek) that would be heavily grazed every year by either livestock or wild horses. It is not expected that streamside vegetation for those streams would increase in vigor or cover. In fact, the riparian zones would become heavily grazed regardless of the season of use. These same impacts would occur around the periphery of Little Fish Lake with compounded impacts in pasture 5 which receives yearly use.

Treatment A in the Stone Cabin allotment consists of grazing (cattle only) from April 10 to May 9. This time period occurs on an average of five days prior to growth of the key forage species and about 20 days into the key forage species growing period. This should allow for some regrowth providing moisture is available. This grazing treatment follows treatment D (yearlong rest) after the first year which would allow livestock to come into a pasture with old growth vegetation.

Treatment B consists of livestock grazing from May 10 to August 9.

This time period provides for the early growth of the important forage species. Grazing would constitute a drain on the food reserves with little to no regrowth potential. If regrowth did occur it would be consumed by livestock. This treatment would be followed by treatment C below.

Treatment C consists of grazing from July 25 to October 31. By July 25 all key species, except winterfat and fourwing saltbush, would have reached seed-ripe. This would allow these seed-ripe species to restore all food reserves, regain vigor, produce seed, and allow livestock to trample the seed as well as increase litter.

Treatment D is season-long rest from livestock grazing. This would allow for vigor, initial seedling establishment, and litter accumulation.

It should be noted that the Stone Cabin allotment would have 235 head of wild horses grazing yearlong under the proposal. The continual grazing of wild horses would decrease the livestock grazing treatment effects. This would be especially true around waters. Deer winter range also exists on pasture 6 in the northeast corner (see Wildlife). Under this system major impact between deer winter range and livestock could occur during treatment C. There should be little vegetative competition during the other treatment except by wild horses.

PRELIMINARY DRAFT

Three Pasture Deferred-Rest Rotation Systems: There are 1,910,344 acres (43 percent of total study area) encompassed by this grazing system. This includes Blue Eagle allotment (44,560 acres), Ione allotment (191,099 acres), San Antone-Smoky allotment (1,223,148 acres), and the Ralston portion of the Ralston-Monitor allotment (472,117 acres).

The difference in these systems is the season of use and class of livestock. Blue Eagle allotment is May 1 to September 30, while Ione and San Antone-Smoky allotments are November 1 through April 30 and June 30, respectively.

During treatment A in the Blue Eagle allotment, livestock grazing (cattle only) occurs from May 1 through July 15. During this stage all major forage species are in a early growing green period. In the first year of implementation, grazing during this time period would reduce vigor, litter, and seed production of the key forage species, mainly grasses. After the first year this grazing period would follow a yearlong rest period (treatment C).

Treatment B (July 16 to September 30) grazing period is designed to allow forage removal after seed-ripe of alkali sacaton. This treatment would allow all the key species, except winterfat and fourwing saltbush, to restore their food reserves. It would allow seed trampling of the grass species and an increase of litter.

Treatment C is a yearlong rest period. This would allow plants to

restore vigor, accumulate litter, produce seed, and give seedlings a one year period to establish. This system is highly oriented toward grass production. The main competition for forage on these pastures would be between antelope and cattle. Although antelope were allocated full AUMs required for reasonable numbers, the proposed fencing would restrict their movement and change their forage utilization pattern (see the Wildlife section).

The Ione and San Antone-Smoky allotments have a proposed grazing season of November 1 through April 30 and June 30, respectively. The Ralston-Monitor allotment (Ralston portion) has a grazing season of November 15 through June 15. The Ione allotment would be grazed by both cattle and sheep, while San Antone-Smoky would be grazed by cattle only.

Cattle in the Ione allotment would graze the entire season (November 1 to April 30), while sheep would graze from December 1 through March 31. Treatment A starts with cattle only on November 1 until December 1 at which time sheep would be introduced into the allotment. For the first year of implementation all the key forage species except winterfat would have completed a growth cycle. Winterfat has restored its food reserves through seed-ripe, but would not have completed its cycle through seed dissemination. This treatment would trample winterfat seed. Although there would be a large amount of dry grass feed available, cattle and sheep would be utilizing a higher percentage of browse, especially sheep. Studies (Cook et al., Nutritive Value, 1968) on similar vegetative type

PRELIMINARY DRAFT

in November, indicates that sheep consume an average of 60 percent shrubs. They show a high preference for winterfat, which made up an average of 30 percent of the shrub diet, although it is only 17 percent of the vegetative composition. Although competition for forage would be moderate at the beginning of the grazing period, the competition would be concentrated on winterfat. There is flexibility written into the AMP that would allow sheep to change pastures if vegetative conditions warrant such a change.

Treatment B (February 1 to April 30) would have the same impact as treatment A.

Treatment C is rest yearlong.

In general, the three pasture deferred-rest rotation system should provide a high degree of grass vigor with a moderate to slow vigor for winterfat. Although winterfat has stored its food reserves before livestock grazing is allowed, the majority of the reserves are stored in the parts of the plants that would be grazed by livestock. This food reserve would be diminished two out of the three years. Studies on winter sheep ranges have shown sheep preference for winterfat to increase under lower vigor of the plant (Hutchings and Stewart, Increasing Forage Yields, 1953).

San Antone-Smoky allotment and Ralston-Monitor allotment (Ralston portion) grazing periods (cattle only) are November 1 through June 30 and November 15 through June 15, respectively.

PRELIMINARY DRAFT

Treatment A is cattle grazing from March 1 through mid to late June. This grazing period would start before the majority of the grass, browse, and forb species start growing and continues through flowering of the majority of the grass species and some of the browse species. In the first year of implementation a definite impact would occur, mostly on the grass species. However, after the first year the system allows for a 16-month period before this pasture would be grazed again from November 1 through February 28. In actuality this a full year's growing cycle. The treatment in the following year is a rest period. Each pasture would receive spring grazing, 16 months rest, fall grazing, then 12 months rest. Although the Management Framework Plan (MFP) shows 15 head and 90 AUMs allocated to wild horses this would not cause significant competition for forage. There are primarily two places where forage competition would occur between mule deer and cattle. These are in the north end of pasture 2 [Cloverdale pasture (actually on forest lands)] and in northwest corner of pasture 1 (Manhattan pasture). In the spring grazing period (March 1 to June 30) there would be a little competition for the early green growth of grass species which would occur one year out of three. In the fall-winter grazing period (November 1 to February 28) there would be a little competition for browse species one year out of three. In both situations competition would be significant, in light of a deficiency (708 AUMs) in deer forage allocation. (See wildlife section of this Chapter.)

PRELIMINARY DRAFT

Two Pasture Deferred-Rest Rotation: There are two allotments containing 216,670 acres (five percent of the total area). The two allotments are Butterfield allotment (59,800 acres) and Hot Creek allotment (156,870 acres). The season of use on Butterfield allotment is June 15 through September 15, while Hot Creek is June 1 through October 31.

Both allotment systems are strictly a late spring grazing use period followed by a complete year's rest. Although use on the Butterfield allotment starts only 15 days later than Hot Creek's, there is an advantage to this 15 day period as the majority of the grass plants have reached flowering. Thus, 90 percent of the food reserves have been restored and the amount of grass seed produced would be greater, i.e., more would be trampled for new seedlings. Response in vigor, new seedlings, and litter would be higher and faster. Both allotments under this system would be grazed by cattle only.

Four Pasture Deferred-Rotation Systems: There are 512,972 acres of the study area (12 percent) and three allotments proposed under this type of grazing system. These are: Nyala allotment (324,425 acres), Hunts Canyon allotment (173,597 acres), and Darrough Hot Springs allotment (14,950 acres). Although these allotments are under the same type system, the seasons of use are considered different. Hunts Canyon allotment season of use is winter-early spring (December 1 to May 30); Darrough Hot Springs allotment is late spring-winter (May 1 to December 31). Nyala allotment is summer, fall,

PRELIMINARY DRAFT

winter (June 15 to April 15). These allotments would be grazed by cattle only.

Hunt's Canyon allotment is broken into four pastures, however, pasture 4 in the north end is less than half the size (13,100 acres) of any of the other pastures, and contains only 121 livestock AUMs. It would be used every year for early spring trailing and to gather cattle that have drifted off national forest land in late September and October.

Hunt's Canyon treatment A (12/1 to 1/30) is grazed after all major forage species, except winterfat, have completed a growing cycle. Winterfat would be in seed dissemination which allows the plant to restore about 100 percent of its food reserves. Cattle grazing during this time period would allow seed trampling. Grazing, however, would reduce food reserves of winterfat, especially when cattle are turning more to browse for higher protein.

Treatment B (4/1 to 5/30) is the critical grazing period for the major forage species since it occurs when plants are in an early growing stage. This grazing period following the end of grazing January 30 (treatment A) could result a the lack of forage.

Treatment C (2/1 to 3/30) would be grazed after the growing season for all vegetation. However, this treatment following spring grazing (treatment B, 4/1 to 5/30) allows plants that were grazed to

PRELIMINARY DRAFT

have only 40 percent of their growth period to regrow and provide forage for livestock.

Even though 40 percent of the growing period remains there would be less than 40 percent regrowth forage yield. Also, because livestock grazing habits are to return to the same area and plants, there would be an increased impact on the more desirable species, such as Indian ricegrass and wild rye. This would be especially true on national resources land (NRL) as this is a cold period for national forest lands which are about 1,500 feet higher in elevation. Consequently, livestock would have a tendency to drift downhill to NRL. There is an additional impact as the result of wild horse use during this time period on lower elevation NRL, coupled with yearlong antelope use.

Darrough Hot Springs allotment is divided into four pastures, however, pasture 4 (4,020 acres) is really not part of the system in that the proposal is to graze this area every other year from May 1 to July 30 for a maximum of 120 AUMs. Presently there is a recognized 122 AUM deer deficiency in this area which is deer winter range. If livestock are allowed in this pasture every other year competition for early spring growth would occur.

Treatment A (7/20 to 10/10) is summer grazing by cattle. July 20 is seed-ripe for alkali sacaton and about five days past flowering for wild rye and the majority of all other grass species. This would allow alkali sacaton to produce seed and restore almost 100

percent of its food reserves; then livestock would trample the seed. All other grass species would have restored approximately 90 percent of their food reserves. This treatment would allow at minimum 90 percent of food reserves restoral, increase in litter, and seed trampling.

Treatment B (10/11 to 12/30) would provide seedlings one growing cycle to become established and the majority of major forage species to complete a growth cycle before being grazed by livestock. This treatment would enhance vigor, and increase litter.

Treatment C (5/1 to 7/19) is grazing during the critical growing season. Any plants grazed would have little to no chance for regrowth after July 19. According to the grazing sequence and schedule this treatment follows treatment B (discussed above) in which the livestock grazed from October 11 to December 30 have already taken all the available dry feed. This means that livestock coming on this pasture May 1 would be forced to eat already grazed plants as well as turning to undesirable species for food. All meadow areas would be heavily impacted and perennial grass plants would be replaced with undesirable annuals. If wet meadows are fenced, livestock would have difficulty in finding enough forage.

Nyala allotment is divided into four pastures with a grazing season June 15 through April 15 with cattle.

Treatment A (6/15 to 8/30) would allow the majority of the important forage species to reach flowering stage before any grazing starts. This would allow the plants to restore approximately 90 percent of their food reserves. A small amount of seed trampling would occur.

Treatment B (11/15 to 1/30) would allow virtually all plant species to restore 100 percent of food reserves, increase vigor, produce seed, provide for litter accumulation, and some seedling establishment. There would also be some seed trampling of winterfat.

Treatment C (2/1 to 4/15) would allow all plants to rest, restore food reserves, increase vigor, produce seed, and increase plant litter. It would also allow for seedling establishment before livestock are allowed to graze.

Treatment D (9/1 to 11/15) would allow the majority of the plants to produce 90 percent of food reserve before grazing would be allowed.

This system gives three continuous years deferment of livestock grazing for plant vigor, trampling of key species seed, allows for litter accumulation and for seedling establishment. The key to this system is being off NRL from April 15 through June 15 during the early growing season. Competition for forage between antelope and cattle would result. However, this competition would occur primarily during treatment A (June 15 to August 30). There would be some competition for forage between deer and cattle during early spring and early fall

in pastures 2 and 3. With the proposed gap fences this should, however, be minimal.

Three Pasture Deferred Rotation: There are 411,418 acres (nine percent of the study area) proposed under this type of grazing system, all within the Hot Creek allotment. This allotment would be used by both cattle and sheep. Only pasture 3 would be used by both; the other two pastures would be for cattle only. Sheep use in pasture 3 is proposed for the same season every year (November 1 to March 31); this pasture is some 90,000 acres larger than either 1 and 2. This system is complicated in that every year, for the first three years, the season of use changes (see Appendix A). Although the dates change every year for the first three years, this analysis would only be on the first year's grazing dates since deviations shown are not great enough to warrant separation .

Treatment A (11/1 to 12/31) would allow all forage plants to grow, restore food reserves, produce seed, and increase litter.

Treatment B (4/1 to 5/31) is the critical growing period for almost all species. Grazing during growth would decrease vigor for the next year. This treatment following treatment A would have a detrimental effect on all heavy use areas; especially around water areas such as Moores Station Wash, Treatment A (11/1 to 12/31) has already taken 2,150 AUMs of livestock forage. Just as growth starts, livestock would be turned back into the sampe pasture. This

treatment would decrease plant vigor and consequently would not allow range improvement.

Treatment C (1/15 to 3/14) is a time period when plant species have made full growth. However, under this proposal there exists a problem. In treatment B (4/1 to 5/31) approximately 50 percent of the growing season has already been utilized leaving 50 percent of the growing season before livestock grazing would be allowed under treatment C (1/15 to 3/14). Even though 50 percent of the growing season is left there would not be 50 percent of the forage volume produced. Even if 50 percent were produced, the pasture would already be stocked at top carrying capacity for livestock.

Two Pasture Deferred Rotation: There are 230,465 acres (five percent of the study area) proposed under this grazing system to include the Blue Eagle allotment (20,580 acres) and Stone Cabin allotment (209, 885 acres). Although season of use in the Blue Eagle and Stone Cabin allotments are primarily winter-early spring, they are analyzed separately because of the differences in wild horse and wildlife use.

The proposed season of use for the Blue Eagle allotment would be October 1 to February 28 for cattle only.

Treatment A (10/1 to 12/15) would allow all major forage species to restore food reserves, produce seed, and gain vigor. It would also allow for some seed trampling of winterfat. Because of steep

terrain on the east side of this allotment there would be little competitive use between livestock and wildlife. Plant litter would also increase.

Treatment B (12/15 to 2/28) would have the same vegetative effects except for a reduced amount of seed trampling. Plant species would show increased vigor and litter and grass species would show a greater increase in vigor.

Season of use in the Stone Cabin allotment's two south pastures would be November 1 to April 9. The key forage species for these two pastures are Indian ricegrass and winterfat. Treatment A (November 1 to February 19) would allow all plant species to restore 100 percent of food reserves, produce seed, and increase vigor. This treatment is also approximately 15 days after seed dissemination of winterfat and as a result, some seed trampling would occur. Cattle would be exclusively on dry feed in most years. By November 1 the grasses would be low in protein and cattle would be turning more to browse species. Browse specie use should gradually decrease as vigor of grass species increase and species composition changes. This season of use would also have a tendency to decrease the competitive uses in the higher country in the Kawich range.

Treatment B (2/20 to 4/9) would have the same effects of treatment A except that there would be little to no seed trampling and cattle would turn more toward grass species later in the year during the years that green-up starts. This should not, however, be a detrimental effect on grass species as the majority of the growing season comes after April 9. Heavy use patterns would have a tendency to be less noticeable since during this cool season, cattle distribute themselves better and don't concentrate as heavily at water locations. The season of use for this system should provide increased plant vigor for all plant species. However, seedling establishment of the grass species would be slow because of the lack of seed trampling and the large amount of halogeton, Russian thistle, and rabbitbrush in the valley bottom (Willow Creek Wash). Another point to be considered is that wild horse use on grass species would continue through the growing season.

Two Pasture Deferred System: The Butterfield Springs allotment is the only allotment proposed under the two pasture deferred system. It would contain 88,400 acres or two percent of the study area. The season of use would not rotate, but stay the same on each pasture. The season of use on winter pasture 1 would be August 24 to October 31; on winter pasture 2 use would be from November 1 to December 31.

Treatment A (8/24 to 10/31) would allow the greatest majority of the plant species to restore 100 percent of their food reserves, produce seed, and increase vigor. It would also allow for seed trampling of

alkali sacaton which is the key plant species in this pasture. Litter would also increase. The only competitive use in this pasture would be from a few head of antelope.

Treatment B (11/1 to 12/31) would allow all plants to complete a growth cycle, increase vigor, produce seed, and increase plant litter. There would be limited competition for forage between livestock and deer, especially because of the steep topography. Livestock in the south end of the allotment would be restricted primarily to the canyon bottoms. Little competition between bighorn sheep and cattle would be expected because of the steep terrain.

Two Pasture, Three Treatment Rest-Rotation System: The Willow Creek allotment containing 49,113 acres (one percent of study area) is presently under this system. The entire season of use is June 11 to October 10 for cattle only. The key plant species are needle and threadgrass, Indian ricegrass, Sandberg bluegrass, and antelope bitterbrush. The system is geared on plant phenology of the latest developing key plant species (needle and threadgrass). Treatment A is a grazing season June 11 to October 10 in one pasture, but with reduced cattle numbers from July 26 to October 10, when 100 of the original 215 cattle would be placed in the second pasture. In the second year all cattle would stay in the first pasture from June 11 to October 10. The pasture that was used in the second phase of the first year would have a complete year's rest. The third year's sequence is to reverse the first year's sequence of pastures. With the drastically reduced AUM authorized,

and the grazing sequence and systems this allotment should show great improvements.

Range Improvements

Construction of fences, cattleguards, spring developments, wells, reservoirs, pipelines, and troughs would have a short-term, localized effect on vegetation which would be disturbed during construction and development activities. Some vegetation at project sites would also be destroyed by taking up space for particular projects such as post, tanks, wells, and reservoirs.

Some vegetation would be destroyed along fencelines where cattle have a tendency to walk. Ripping of earth for pipelines would destroy some vegetation in a narrow strip.

The total disturbed area from all these construction activities can be found in Table III- I , Construction Activities. The area, however, would be insignificant as far as the actual loss in vegetation is concerned.

Land Treatments

The 3,160 acre spray projects would reduce the amount of browse species as well as forb species. These projects would change the vegetative composition to a dominant grass type. The reduction from

loss of brush species would result in increased availability of soil moisture for grass species, short-term increase in erosion, and initial increase in annual species. All these amounts depend on the amount of vegetation, and kinds of vegetation on the particular site. These projects are proposed on sites that are considered borderline in terms of respond to management within the 20-year time period. They would not be started until the eighth year of implementation and only then if allotment objectives are not being obtained.

Thirty-six thousand six hundred acres of spray and seed are proposed. In addition to the impacts associated with spraying, there would be additional impacts from changes resulting from the use of drill rows. Unnatural and non-native species such as crested wheat and most of forb species such as alfalfa and clovers would be introduced. The conversion of vegetative to grass types would be minimal when considered under vegetation itself as compared to the secondary effects on watershed, livestock, recreation. The main impact to vegetation would be reduction or loss of overstory vegetation or canopy cover change from browse to grass. When drills are pulled over a dead brush area the amount of litter should increase. Initially vegetative cover would decrease because of canopy cover loss, but cover should increase in long-term..

Threatened or Endangered Species

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The basic effects of the proposed action on vegetation in general, i.e., trampling, soil compaction, rest, and in some cases consumptive use, would also apply to any threatened or endangered plants in the area.

Since there is no detailed information on the precise location of these plants, it is difficult to identify potential impacts.

Further, there appears to be little specific information as to the relative palatability of most of these plants. Some general information has been found, however, and is presented below. This information is derived from A California Flora (Munz and Keck, 1973), Arizona Flora (Kearney and Peebles, 1951), palatability tables prepared by the Interagency Range Survey Committee for Arizona and New Mexico, and Nevada Bureau of Land Management (BLM) proper use tables. The latter two give an indication of the relative consumption of these plants by livestock. The data derived from all these sources is based mostly on each genus as a whole or on species within these genera other than the particular threatened or endangered species in question.

Abronia: Low use by cattle and horses; low to moderate use by sheep.

Arabis: Slightly palatable to cattle and horses; moderately palatable to sheep.

Asclepias: Use tables classify the plant as poisonous. Some species contain a substance (glucoside) that is poisonous to livestock, especially sheep, but the plants are rarely eaten (Kearney, Peebles, Arizona Flora, 1951).

Astragalas: Also classified as poisonous. Some species contain the poison causing the "loco disease" but are seldom eaten when better forage is available; it is said to be habit-forming. Other species accumulate the element selenium and should be regarded with suspicion. (Kearney, Peebles, Arizona Flora, 1951.)

Castilleja: Low to moderate use. The genus is reported to be of value for livestock forage where abundant (Kearney, Peebles, Arizona Flora, 1951), but it is doubtful that a threatened species would occur in such numbers in the study area.

Coryphantha: A cactus.

Cryptantha: Several species are reported to have value as sheep forage. No use by cattle.

Draba: Low use by cattle; moderate use by sheep.

Gilia: No use by cattle; moderate use by sheep (based on G. aggregata).

Ivesia: No information was found on this genus, but the closely related Potentilla is not used by cattle, and only slightly used by sheep.

Penstemon: Low use by cattle; low to moderate use by sheep. Kearney and Peebles (Arizona Flora, 1951) report some species of horticultural value. The plants otherwise are not of economic importance, although some are browsed.

Trifolium: Highly palatable to both cattle and sheep.

Lesquerella, Lewisia, Machaeranthera, Silene: No use information was found.

Expansion of the use area for livestock, and increased density of livestock in any one pasture could have an effect on a threatened or endangered species. At the present time, the effect of livestock grazing systems on the status of threatened or endangered species is not known. It is possible that consumption of "normal" forage species in an area could enhance the environment for threatened or endangered plants. It is also possible that the recovery of forage species during rest years could result

PRELIMINARY DRAFT

in competition between the forage plant and the threatened or endangered plant.

Construction of management facilities, and/or land treatments could, however, could cause profound impacts to threatened or endangered plants. Vegetation removal during construction, establishment of roads to new facilities, use of heavy equipment, spraying, and seeding with competitive species, all could have a highly adverse impact on threatened or endangered plants.

Potential impacts by allotment are outlined below. It should be noted that lack of evidence for the existence of a threatened or endangered species in an area does not necessarily imply that it isn't there.

Blue Eagle, Butterfield Springs, Nyala: There are no reports of threatened or endangered species in the area, although some are reported from surrounding areas (see Threatened or Endangered Plant Map).

Reveille: The following threatened species are reported from this area: Abronia orbiculata, Astragalas callithrix, Gilia nyensis, Penstemon pudicus. The first three could be affected by proposed highway fencing (five locations--see above mentioned

PRELIMINARY DRAFT

map). Impacts related to fences are both short-term and long-term. Construction (short-term) results in vegetative removal at post locations, and establishment of a trail caused by construction vehicles. Depending on how dispersed a colony of threatened or endangered plants is, the impact could range from moderately to highly adverse. Long-term impacts could result from periodic use of the "trail" along the fence for maintenance and other purposes, and from cattle trailing along the fence. Therefore, even if a seed source remained, it would be difficult for plants to re-establish themselves adjacent to fences.

Hot Creek: Astragalas callithrix, and the endangered species Astragalas serenoi v. sordescens and Machaeranthera leucanthemifolia are reported from this area. A. callithrix and M. leucanthemifolia could be affected by proposed highway fencing; A. s. sordescens could be affected by proposed well development in the Big Sand Spring Valley.

Wagon Johnnie: There are no threatened or endangered plants reported from this area.

Stone Cabin: The threatened species Cryptantha hoffmannii is reported from this area. Proposed highway fencing could affect it.

PRELIMINARY DRAFT

Ralston-Monitor: The threatened species Astragalas toquimanus, and the endangered species Asclepias eastwoodiana are reported from this area. The threatened species Astragalas pseudiodanthus is reported a few miles south of this allotment (20 miles southwest of Tonopah) and in the vicinity of Tonopah. Proposed fencing and well projects could affect A. pseudiodanthus in the southern part of the Ralston allotment.

Hunts Canyon: The threatened species Coryphantha vivipara v. rosea and the endangered species Astragalas serenoi v. sordescens could be affected by proposed pipeline, well, and fence construction, as well as by proposed spraying and seeding projects in the northern third of this allotment.

Francisco, Darrough Hot Springs: There are no reported threatened or endangered species in these allotments.

Ione: There are no reported threatened or endangered species within the allotment, but two sites of the threatened Astragalas pseudiodanthus are reported nearby in the vicinity of Gabbs and Lodi Valley.

San Antone-Smoky: The threatened Penstemon arenarius and the endangered Trifolium andersonii ssp. beatleyae are reported from this area (although the latter could be in the neighboring Ral-

ston allotment). The Penstemon was reported (1974) in the vicinity of the proposed pipeline west of the San Antonio Ranch.

Willow Creek: There are no reported threatened or endangered species in this allotment.

PRELIMINARY
DRAFT

PRELIMINARY
DRAFT

Wildlife

Livestock grazing and associated land use practices would affect wildlife and their habitat in various ways. Impacts would result from all phases of the proposed action, i.e., alteration of grazing patterns, construction and utilization of management facilities, and land treatments. The proposed action with requisite livestock concentration, and supportive measures would cause direct and significant impacts on the complete spectrum of wildlife inhabiting the Tonopah study area. Both detrimental and beneficial impacts could be expected, depending upon the specie involved and its habitat requirements.

Terrestrial Habitat

The concentration of livestock on two-thirds to four-fifths of the previously utilized area, as proposed in the rotation of use for each allotment, would necessitate utilization of a wider range of grasses, forbs, and shrubs because of the inability of livestock to forage over a larger area selecting only the most desirable plants. The increased use of previously less used plants would serve to intensify competition between livestock and wildlife depending upon the use areas for forage and the cover provided by the potential livestock forage.

Big Game

Greater livestock density for each pasture and consequent utilization of browse, grasses, and forbs would create competition in common use pastures for forage and living space. The herbivorous big game animals, such as mule deer, pronghorn antelope, and bighorn sheep, would be directly impacted by the proposed grazing. The primary impacts on these animals would relate to changes in the amount of forage available to each, and the degree of competition which would remain between the big game species and proposed livestock use.

Implementation of the proposed grazing systems would affect big game through an improved vegetative condition consisting of increases in plant vigor, production, ground cover, and species composition desirable for wildlife. This improvement in vegetative condition would vary depending on the extent of existing deterioration, and magnitude of the change proposed in the system. The projected change in vegetative condition is evaluated in the Vegetation section of this chapter which describes impacts on terrestrial vegetation. It is assumed that competition could never be totally eliminated when rangelands are used by both domestic livestock and herbivorous big game because of direct overlaps in food preference. Grazing use by both groups could, therefore, be considered compatible if competition is reduced to that level at which grazing by one group would not affect the

condition, use, or viability of the other. The degree of competition which would be expected to occur between livestock and herbivorous big game animals as a result of the proposed grazing systems is rated for each allotment in the Impacts on Terrestrial Wildlife Table, III-3.

PRELIMINARY
DRAFT

PRELIMINARY DRAFT

TABLE III-3
IMPACTS OF THE PROPOSED GRAZING MANAGEMENT SYSTEMS ON
TERRESTRIAL WILDLIFE OF THE TONOPAH STUDY AREA

A designation of habitat importance, i.e., critical, important, etc., and anticipated change, high moderate, low, with definitive + or - notations.

PRELIMINARY DRAFT

Significant changes in the amount of forage available for herbivorous big game animals and the relative level of competition between these animals and livestock would occur as a result of specific proposed actions. These actions include significant reductions in livestock, changes in season of use, and changes resulting directly from the type of grazing system proposed for each Allotment Management Plan (AMP).

Significant reductions in livestock stocking rates, and allocation of forage to meet big game needs, as a part of the proposed AMPs, would generally reduce livestock big game competition and increase forage quantity and quality through elimination of excessive livestock grazing. Reductions of over 20 percent in Animal Unit Months (AUMs) are proposed in all but one allotment.

Changes in livestock season of use would also have significant impacts on big game populations and their habitat. Cattle and sheep have the greatest dietary overlap with deer, antelope, and bighorn sheep during winter months because of a tendency of most animals to seek the higher protein available in browse during this period of stress. Changes of seasonal use periods and areas would occur on all 14 AMPs because of proposed rotational grazing.

Impacts resulting fromgrazing systems would occur through concentration of livestock in seasonal use pastures. The added

density of livestock, with the increased forage utilization, would result in forage competition or exclusion of big game into adjacent pastures free of livestock for the season or yearlong, depending upon grazing sequence. The degree of competition would vary depending upon season of use and willingness or opportunity for big game to take advantage of rested pastures. Forage in rested pastures and regrowth in (summer) early use pastures would be reserved for wildlife forage and cover.

The short-term impact anticipated is an increased competition between livestock and big game during and following concentrated livestock use of the grazed pastures. The reservation for big game of forage previously allocated to livestock, and cyclic exclusion of livestock use from large areas could be expected to reduce overall competition below present levels. The long-term net impact is expected to be positive for big game. The eventual improvement in range condition as expressed in plant vigor and density would also benefit big game animals directly in the form of forage and cover and indirectly as a general improvement in the ecological condition of their habitat.

The proposed grazing systems could have a long-term negative impact on mule deer, and to some extent antelope, by changing the forage composition from browse (preferred deer forage) to grass. Many of the proposed AMPs have established rotation sequences to favor grasses, which in time would be realized at the expense of forbs and browse. This change is expected to occur subtly over

the long-term, with vegetative composition change probably amounting to less than 10 percent overall within the foreseeable future.

The concentration and attendant high use of water sources, meadows, springs, seeps, and creeks would continue or maintain the existing deterioration of the riparian (streamside) and associated mesic (habitat requiring a small amount of water) vegetation crucial to wildlife. While grasses in general are less preferred by deer than are browse and forbs, they often constitute an important part of the diet during the spring period. (Doman, Forage of Mule Deer, 1943).

The green grass provided by the small meadow areas associated with water sources may constitute as much as 90 percent of the diet of deer in the early spring (Muchmore, Livestock Effect on Deer Range, 1969). This forage requirement and limited nature of riparian and meadow areas results in concentrated use by mule deer. This impact as related to specific pastures or AMPs is noted under subsequent sections describing affects on mule deer, seasonal use, and crucial areas.

Mule Deer: The most important ranges for mule deer in the study area at present (1976) population levels are the Kawich summer use area and

Morey Bench winter range. The high use areas of the Morey Bench winter range are encompassed within a larger area of approximately 23,680 acres. The low population levels of recent years has confined the majority of deer use to approximately 2,500 acres. The majority of the larger total area would be crucial to expanded populations realized from more productive herds.

The Kawich concentration areas are encompassed within a total summer use area estimated at 9,000 acres. As with the Morey Bench area, concentrations of summering deer are not utilizing the total area as a result of low population levels and the lack of specific habitat elements in some areas.

The larger crucial areas identified represent the total area encompassing numerous smaller concentration areas. Key forage species in these areas include desert bitterbrush, Anderson peachbrush, mountain mahogany, and various grasses and forbs. Livestock grazing of these areas and the remainder of the study area supporting winter and yearlong populations of mule deer would result in substantial use of both grasses and shrubs by livestock in areas where deer concentrate to "overwinter" or range through the year. The grazing of these high use areas would result in competition for forage between livestock and mule deer and in the utilization of those areas having greatest impact on deer of the region due to limited size and heavy dependence on these ranges. The six proposed AMPs of Wagon Johnnie, Hot

Creek, Reveille, Nyala, Butterfield, and San Antone-Smoky allotments encompass the primary mule deer concentration areas within the study area.

Hot Creek Allotment--The heaviest deer winter concentration areas within management unit 16 are encompassed within the proposed Hot Creek AMP. The primary deer ranges of this area consist primarily of shrub species, including big sagebrush, antelope bitterbrush, black sagebrush, snowberry, and Anderson peachbrush. Perennial grasses and forbs are virtually absent or greatly reduced in nearly all areas of heavy deer and livestock use. (Tueller, Monroe, Management Guidelines, 1975). Although 6,223 AUMs of forage are allocated to mule deer in this allotment, competition for forage and living space can be expected within the pastures 4, 5, and 1 (Pritchard, Hot Creek, and Tybo pastures). Competition would be light to moderate for browse plants, especially bitterbrush, as a result of high livestock-mule deer diet overlap during the proposed grazing periods, which includes livestock use during October, November, and December. These proposed use periods would directly overlap the customary mule deer use periods of late October through May. In addition to the overlapping use, the pastures scheduled for treatment B (grazing 6-1 to 10-31) every two years, would result in significant use of forage prior to the time deer would normally move onto the area.

The concentration of livestock in the proposed pastures with

subsequent moyements and associated actions would occur at a period of peak stress for wintering mule deer, thus excluding deer from the use area for at least the period of initial activity. The increased densities and additional human disturbance related to the proposed action could adversely affect wintering deer through exclusion from customary use areas and competition for forage.

The concentration and diet preference of livestock in winter months for bitterbrush and other palatable browse species, already in reduced abundance from past grazing excesses, would increase competition for select species. The anticipated preference for bitterbrush by livestock and mule deer, when considered in light of a deficiency of the proposed action in enhancing bitterbrush production, would result in competition for quality browse in spite of the forage allocations. This is because of long-term decline in bitterbrush production (see Vegetation III, Hot Creek AMP in this chapter).

The concentration of livestock and high use of meadow and riparian vegetation surrounding water sources, springs, seeps, and streams would continue under the proposed systems. The periodic rest followed by concentrated use would maintain the existing deterioration of these crucial wildlife areas, as indicated by Hormay, Rest-Rotation Grazing, 1976, when he states, "Vegetation in certain areas, such as meadows and drainage ways are in-

PRELIMINARY DRAFT

variably closely utilized under any stocking rate or system of grazing. Such use may be detrimental to wildlife, esthetic, or recreational values."

While limited improvement would result from the yearlong rest periods, the periodic livestock use would impair significant restoration and deny mule deer the needed forage. Grasses in early spring are required for growth in body size and weight, antler development, fawning, and nursing. Their needs for succulent high protein foods are reflected in use of green grass and forbs during the critical spring season. (Smith, Mule Deer Use of Grasses, 1976.)

While competition for forage and space within common use areas (areas between 6,000-7,000 feet) would continue, the allocation of adequate forage, in conjunction with sequential exclusion of livestock from large areas for up to 20 months, would provide an overall benefit to existing populations. The forage allocation, rested pastures, and exclusion of livestock from the proposed primitive area and back packing areas would result in an increase in population from an estimated 750 to 1,500 mule deer, utilizing habitat in the allotment. Although competition between livestock and mule deer would be reduced from present levels, impacts could be expected from concentrating livestock into areas habitually used as winter range. Several studies have demonstrated the innate ability of grazing animals to select the more

nutritious forage (Cook, et al., Effects of Grazing, 1953; Bessell, Chemical Analysis of Browse, 1959.) Thus, while total forage allocated for mule deer is more than adequate, the seasonal competitive livestock use would result in competition for quality browse in fall-winter months and for grasses and forbs in spring-summer periods.

While it is not known what impact the identified competition would have on deer numbers and survival, it is assumed that the following impacts could occur: 1. Possible malnutrition and subsequent high fawn mortality on winter ranges in first year of implementation when livestock and subsequent utilization would be greatest, and 2. some short-term overutilization of winter and spring ranges. Mule deer would be forced to range over a greater area to obtain available forage in these circumstances.

These impacts would be expected to be greatest during the initial implementation of the system and thereafter decline, with the exception of meadow areas, as forage abundance and quality improves.

It is assumed that to a large extent deer would shift customary use areas to take advantage of pastures and areas excluded from livestock use, despite forage reservations which would insure adequate forage in use pastures. The meadow areas would continue as high use areas for cattle and deer with subsequent continuing

PRELIMINARY DRAFT

deterioration.

The reservation of 11,581 AUMs for mule deer, the cyclic exclusion of livestock from large areas, and projected vegetative improvement, is expected to reduce overall competition between big game and livestock to maintain and possibly accelerate the general upward trend for mule deer populations in the study area.

Wagon Johnnie Allotment--The proposed Wagon Johnnie allotment would lessen the present winter and summer competition between livestock and mule deer through cyclic exclusion of livestock from up to 41,870 acres of range for periods as long as one year. These areas would be readily accessible to mule deer and free of livestock either yearlong or seasonally, depending upon pasture grazing sequence.

The grazing sequence, allocation of 2,010 AUMs, and cyclic rest from livestock use, would lessen competition, but would not eliminate it. The late summer-fall grazing (8/1 to 9/15) two out of four years on pastures 1 and 2, would result in livestock use of already limited bitterbrush, aspen, mahogany, and forbs, with resultant competition with wintering mule deer. The selective reduction of quality browse, and a tendency for heavy utilization of canyon bottoms to be expected from fall grazing would reduce the quantity and quality of forage available for mule deer in the foothills and canyon areas accessible to livestock.

PRELIMINARY DRAFT

The spring and summer grazing of accessible bench and canyon areas of pastures 1 and 2 would result in direct competition between livestock and mule deer for the early green-up grasses and forbs sought by each. While the crested wheat seeding would bear the majority of use, it is reasonable to assume there would be continued use of canyon bottoms and drainage areas where mule deer commonly concentrate to seek early grasses and forbs. The continued livestock utilization of stream and meadow areas to be expected despite additional waters and seedings, would continue the excessive use and competition with mule deer. The overall condition, excepting seeded areas, as indicated by a range and condition classification--rating more than 75 percent of the area on poor-fair condition--suggests direct competition between cattle and livestock for grasses, forbs, or browse whenever livestock utilize the unseeded benchlands and foothill areas of pastures 1 and 2. While the browse species of bitterbrush and aspen would continue to be periodically overutilized under the proposed system, the sequential rest and previously absent forage allocation for mule deer would reduce existing competition levels and result in a projected increase. That increase would be from a minimal population of 184 (estimated existing numbers) to 400 under implementation of the proposed system. While attainment of projected numbers would be a major improvement to existing populations, the overall numbers would represent less than one-half the populations known in the years 1956-1958.

Nyala Allotment--The proposed Nyala allotment and associated grazing formula would affect two areas of mule deer winter use: the northern portion of the Pancake Range and the southwest corner of the allotment adjoining the Quinn Range. While allocation of 64 AUMs and percent reduction of livestock use (AUMs) would reduce competition between existing low mule deer populations and livestock, it would not be eliminated.

The late summer, June 15 to September 1, or fall grazing as proposed every year would continue competition for already limited browse such as bitterbrush. The range class condition for sheep of 95 percent fair to poor for the area is generally indicative of mule deer habitat condition. This evaluation of condition is probably conservative in light of livestock concentration on deer use areas such as in the Redbluff Spring area and accessible areas on the Pancake Range. The preference for browse by livestock during fall use periods, (Smith, Cattle and Big Game Range, 1968) would reduce the quality and quantity of forage available to mule deer in overlapping use areas.

Mule deer populations would be expected to increase from present low numbers, estimated at 17 head, to 40 head in response to previously absent forage allocations and reduction in livestock. Should these numbers be attained, competition between livestock and cattle for winter forage could interact to prevent further increase. These circumstances maintain deer use in the areas

approximately 50 percent below potential as indicated by peak populations of the 1950's.

Reveille Allotment--The proposed grazing management program of sequential concentrated grazing followed by resting of each pasture for a 12-month period would affect mule deer use of winter and summer habitat on the east half of the Kawich Range, Reveille Range, and a small area of the Quinn Canyon Range. The allocation of 725 AUMs of forage previously licensed to livestock and percent (AUMs) reduction of livestock use would lessen existing forage competition between low populations of mule deer and cattle.

Competition would continue as a result of fall use of pasture 4 (N. Reveille Range) because of a common preference for palatable browse and overlapping season of use. Primary periods of mule deer use--November through March--would coincide with livestock use occurring from November through March two out of five years.

The fall competition for browse in pastures 1 and 2 would continue and possibly increase as a result of the season of use, increased density of livestock, and present overall poor range condition. Ninety-nine percent of the allotment is rated in poor condition for cattle and horses, with 82 percent of the total allotment in poor condition for sheep. The generally poor range condition and fall use periods when both livestock and mule

deer depend heavily on browse would result in continuing competition and overuse of key browse species, such as snowberry, desert peach, and cliffrose. Limited inventory of deer ranges alongthe east and west sides of the Reveille Range indicates existing utilization of 70-100 percent of these preferred browse forages. The seasonal concentration in the east and west slope pastures, as proposed, can be expected to result in continued overutilization during fall use periods.

The spring and fall use by livestock of yearlong mule deer range on the east slopes of the Kawich Range three out of five years would result in direct forage competition between cattle and mule deer. The early spring use 4/1 to 6/31 scheduled for one out of five years would reduce the availability and quantity of early green-up grasses required by mule deer during this time of year. The tendency of livestock to concentrate along canyon bottoms and spring areas would further reduce opportunities for mule deer to obtain critically needed early green-up grasses, and forbs.

The proposed concentration of wild horses in the pasture adjoining both winter range of the Reveille Range, and yearlong habitat of the Kawich Range would expand competition to areas inaccessible to livestock on a yearlong basis. The combined use of mule deer and wild horses, and the sequential livestock concentration would maintain the present poor condition of browse species in these areas subjected to the continuing overlapping use.

The projected populations represent approximately 50 percent of

peak deer numbers of the 1950's prior to the overall decline which continues until the present.

San Antone-Smoky Allotment--The proposed grazing management system for the San Antonio allotment would affect mule deer winter habitat of the San Antonio mountains, and the periphery area below the Toiyabe National Forest. (See the Primary Use Area Map for distribution of mule deer.) The allocation of 1,111 AUMS of forage previously licensed to livestock and percent (in AUMs) reduction of livestock use would lessen existing forage competition between low population of mule deer, and proposed livestock use.

PRELIMINARY DRAFT

While competition for forage would be lessened by the forage allocation, sequential livestock exclusion from large areas, and the reduction of overall livestock numbers, the competition would not be eliminated. The concentration of livestock into one-third the previously utilized area, with attendant diet overlap in fall and spring months would intensify competition during the proposed use periods. High competition for browse can be expected for one year out of three, with a similar situation assumed for early green-up grasses when livestock use periods result in cattle concentrated on mule deer winter and spring areas.

Seasonal livestock concentration within the Cloverdale pasture during winter and spring months would maintain the heavy use of the limited riparian areas below Willow Springs, Barrel Springs, and areas near the U.S. National Forest Service Boundary such as Peavine Creek. Fall and spring livestock use of these deer

PRELIMINARY DRAFT

concentration areas increases forage competition and continues deterioration of meadow sites and riparian vegetation.

Despite noted competition the forage allocation and the cyclic exclusion of livestock from two-thirds of the allotment during any given year would enhance mule deer populations. The habitat improvement realized from the proposed action would increase present low deer populations estimated at 180, to 380 animals.

Butterfield Allotment--The proposed grazing management program with requisite fall use of the Bench pasture and alternate summer use of the Mountain and Twin Canyon pastures (See Appendix A on grazing programs) would directly affect the winter and summer mule deer habitat of these areas. The majority of the area encompassed within the proposed allotment overlaps customarily mule deer use areas on the Grant Range (See the Primary Use Area Map). The allocation of 838 AUMs of forage for mule deer, percent reduction in livestock use, and exclusion of livestock from the Erwin Canyon and mountain pastures for periods of 21 months followed by three months use would reduce competition between mule deer and livestock.

Competition between wintering mule deer and livestock would continue in the Bench pasture as a result of winter use (11-1 to 12-31) proposed every year. Competition for browse, and to some extent space, can be expected to occur yearly during the grazing period of this pasture as a result of concentrating livestock on

mule deer winter range. Competition would range from light to moderate for browse plants, especially bitterbrush, as a result of the high livestock-mule deer diet overlap during the proposed grazing periods. Areas of greatest competition would be expected along lower slopes and canyon bottoms where livestock would tend to concentrate. The yearly utilization of available browse by livestock could affect mule deer population both in the short-term, through direct competition for forage on areas both mule deer and livestock would congregate, and through a long-term diminishment of browse through a grazing sequence which would favor grasses at the expense of browse species. (See Vegetation, Butterfield Allotment, earlier in this chapter.)

While the browse species of bitterbrush, and cliffrose would continue to be overutilized under the proposed system, the long rest provided to portions of the allotment, and a previously absent forage allocation for mule deer, would reduce existing competition and result in a projected increase. The increase would expand numbers from an estimated present population of 286 to 620 with implementation of the proposal. While attainment of projected numbers would be a major improvement over existing populations, the long-term reduction of required browse in favor of grasses, and a present shortage of 567 AUMs required to sustain a "reasonable number", would limit populations to less than one-half the numbers of past high population periods.

Pronghorn Antelope: The primary antelope ranges within the study area which would be encompassed by the proposal are: Butterfield, Nyala, Hunt's Canyon, Reveille, Hot Creek, Wagon Johnnie, Stone Cabin, and Ralston-Monitor AMPs. (See the Primary Use Area Map.)

The study area supports an estimated 280 head which depend on habitat within the proposed allotments yearlong. The early spring grazing (4-1 to 5-30) and fall-winter grazing (10-30 to 3-30) of one-half to two-thirds of the area of each allotment would result in forage competition between livestock and antelope.

Spring grazing of livestock in antelope use areas would result in competition for early green-up grasses and forbs, which are highly sought after by both species. The dietary overlap between livestock and antelope during this period would reduce the overall abundance of grasses and forbs available to antelope in the grazed pastures. The extent to which antelope may move to take advantage of ungrazed pastures depends upon behavior patterns, topography, and vegetative types in the area. When antelope are about two weeks old the bands may range over a wide area, but until then they are normally tied to a relatively small area because of the immobility of the young. Antelope-livestock competition would be moderate to high in common use areas during the fawning period on one-third to one-fourth of the primary

antelope range during any given year. This competition would have the following impacts on antelope: 1. reduced quality forage available to nursing does and kids following weaning, resulting in possible kid mortality and, 2. possible malnutrition and decline in health of nursing does. The degree of impact would depend upon several factors such as nearness of waters, with consequent concentration and utilization of forage and the ability or willingness of antelope to move to adjacent ungrazed areas. The overall adverse impact is expected to be slight as contrasted to present, early spring use over nearly all the area, greater livestock numbers, and limited water sources.

The fall use of one-third to one-fourth of the primary antelope range would result in forage competition for browse species sought by cattle, sheep, and antelope for high protein sustenance during winter months. The fall use by sheep each year in the Sand Springs pasture of the Hot Creek AMP would result in yearly forage competition for browse among antelope, livestock, and domestic sheep on an area where range forage condition studies indicate 81 percent (162,000 acres) is in fair to poor condition. Winter competition for browse would have the following impacts on antelope: 1. reduced quality forage available to antelope during a period of peak stress resulting in possible kid mortality, and overall mortality of animals coming into winter in poor condition and 2. possible malnutrition and decline in health of does carrying kids. The degree of impact would depend upon

several factors such as winter severity and willingness or ability to utilize adjacent rested pastures.

A long-term adverse affect on antelope habitat within the Sand Springs pasture would be the successive decline of palatable browse subjected to concentrated fall grazing every year. The reduction in forage diversity and availability of high protein forage required by antelope would limit antelope use of this area.

The overall adverse impact of fall grazing is expected to be slight with the exception of the Sand Springs pasture where moderate competition would be expected to continue.

The exclusion of grazing from rested pastures, and the lack of grazing on two-thirds to three-fourths of the primary antelope range before July, would be beneficial to antelope. With a forage allocation of 1,617 AUMs expanded numbers, and general vegetation improvement, it is expected that overall antelope habitat would improve to a point capable of sustaining an estimated 725 head. The habitat improvement would have the following impacts: 1. increased carrying capacity and health of adult animals and, 2. improved productivity of the herds.

Bighorn Sheep: The primary ranges for bighorn sheep in the study area, excluding national forest lands, are the Quinn Canyon-Grant Range (approximately 75,000 acres), the Monte Cristo Range (approximately 89,000 acres), and Lone Mountain (approximately 31,000 acres). Forage for bighorn sheep in these areas includes a variety of grasses, forbs, and shrubs. Key species include bitterbrush, Galleta grass, needlegrass, and various forbs. Livestock grazing of these areas could result in substantial uses of both grasses and shrubs by livestock in the lower areas where bighorn sheep concentrate to "overwinter." The grazing of bighorn winter areas would result in competition for forage between bighorn sheep and cattle, with utilization of these areas having greatest impact on bighorn of the study area because of the limited size and seasonal dependence on these ranges. The four proposed AMPs of Nyala, San Antone-Smoky, Blue Eagle, and Butterfield encompass the primary bighorn use areas on NRL (see the Primary Use Area Map).

Nyala Allotment--The proposed grazing management for the Nyala allotment would affect the peripheral bighorn sheep areas below the Humboldt National Forest. While much of the area identified as bighorn sheep range reflects more expansion possibility than existing use, the area below Troy Canyon to Little Middle Creek (25 percent of this area is on NRL) is commonly utilized during winter months. The majority of use by an estimated 22 bighorn sheep, occurs during winter months in the Nyala Place pasture.

The proposed grazing sequence would exclude livestock from this area during winter months (11-16 to 4-15) two out of four years. The late summer-fall grazing which would reduce the supply of forage available to wintering bighorn, would occur two out of four years. The direct winter competition which could occur as a result of overlapping use periods and forage depletion prior to bighorn moving onto winter ranges, would be offset to some extent through a forage allocation of 106 AUMs for bighorn use and a tendency for livestock to use flatter, more accessible areas than bighorns. However, the general downward trend of forage production noted in AMP developement, and the possibility for increased use of steeper slope areas because of increased livestock density would indicate continuing competition. Impacts from competition could result in: 1. malnutrition and mortality of young and weak animals in severe winter, and 2. reduced productivity and poorer lambs born the following spring.

While competition would be expected to continue, the degree would be less than present as a result of the cyclic exclusion of livestock, reduced numbers, and previously absent forage allocation. The limited improvement of bighorn habitat would provide an opportunity to expand present low numbers, estimated at 22 head, to 32, utilizing winter range within the proposed allotment.

Butterfield Allotment--The proposed grazing management program for the Butterfield allotment would affect bighorn sheep

habitat of Grant Range. The primary bighorn use areas include the benches and mountain extending from about Troy Canyon on the south to approximately Box Canyon on the north. This area, of which approximately 19,800 acres are national forest lands, is commonly utilized during winter months, with some yearlong use possible. The majority of use by an estimated 10 bighorn sheep occurs within the bench, mountain, and Erwin (U.S. Forest Service) pastures.

The proposed grazing sequence would result in winter use (11-1 to 12-31) of the Bench pasture every year with the Erwin and mountain pastures alternated with summer grazing (6-15 to 9-15) and rest each year. The late summer grazing every other year would reduce the forage available to wintering bighorn. Winter use of the Bench pasture could result in competition for browse and cured grasses every year as a result of the overlapping use periods of bighorn and livestock. The direct winter competition in the Bench pasture, and forage depletion in the Bench pasture, and in the Erwin or mountain pastures prior to bighorn moving onto winter range would be offset to some extent through a forage allocation of 229 AUMs for bighorn use, and a tendency for livestock to use flatter, more accessible areas than bighorns. However, the general poor condition of approximately 50 percent of the allotment, and additional use of steeper slopes to be realized from the increased livestock density per pasture, would result in continuing competition between bighorn sheep and

PRELIMINARY DRAFT

livestock. Impacts expected from competition would include; 1. malnutrition and increased mortality of young or weak animals in severe winter, 2. reduced productivity and poorer lambs being produced and reared by ewes in poor condition, and 3. possible exclusion of bighorns from use pastures causing animals to move to less desirable, but less disturbed areas. While competition would be anticipated with the proposed grazing, the degree would be less than present (1976) as a result of the cyclic exclusion and yearlong rest of the mountain and Erwin pastures, reduced livestock numbers, and allocation of forage to support expanded populations. The projected improvement of overall vegetative condition would provide an increased density of livestock per pasture forcing use of steeper slopes. The increased utilization would occur on an area of which more than 50 percent is in presently poor condition for cattle and sheep. These two factors could result in direct overlap in use area with attendant competition. While competition is assumed not to currently exist, the fall use of the north and south pastures encompassing historic winter use areas could restrict future use of the area by bighorn. Utilization of bighorn sheep winter areas by cattle during fall months would reduce the supply of forage available to bighorns. The reduction of suitable forage on winter range in this allotment could be one of the factors limiting assumed future population at 20 animals.

PRELIMINARY DRAFT

Management Facilities:

Fences -- The 948 miles of fences proposed could have a significant affect on big game species which migrate and move longitudinally and latitudinally to summer range, winter range, seasonal watering sites, etc. A fence is yet to be designed that does not impede wildlife movements. Although fences would be constructed to wildlife standards, (Chapter I), a certain amount of injury and death could occur when big game animals become entangled in fences or are cut by barbed wire. Open wounds from this cause could readily become infected and would result in death losses.

Fences would have a long-term positive benefit to big game through exclusion of winter livestock use from approximately 3,000,000 acres or 67 percent and yearlong from approximately 991,550 acres for an average year. The areas rested yearlong would be accessible only to wildlife providing large areas of non-competitive forage of improved quality. (Chapter I, Table I-1, Proposed Action.)

The proposed fences would have a secondary impact on wildlife, particularly through the confinement of wild horses to specific

PRELIMINARY DRAFT

pastures. They would restrict wild horses to pastures within the following allotments: San Antone-Smoky, Stone Cabin, Wagon Johnnie, Willow Creek, Reveille, Hot Creek, Ione, Hunt's Canyon, and Ralston-Monitor. Competition would occur through - out the year and with increased intensity during the cyclic livestock use periods. The diet overlap between big game and wild horses for browse in winter and early green-up grasses during spring months would reduce the quantity and quality of forage available to big game in pastures shared with wild horses.

Water Development -- The proposal calls for the extension of approximately 157 miles of pipeline with 103 water troughs; the drilling of 33 wells, and the development of 33 springs. The provision of dependable water in each pasture of every allotment would increase the amount of available water, or in many cases provide water where none previously existed, for an expected overall benefit to big game habitat quality.

Additional waters are proposed to be developed in the Butterfield, Nyala, Hunt's Canyon, Reveille, Hot Creek, Wagon Johnnie, and Ralston-Monitor allotments. This would encompass habitat of existing antelope populations, thereby amplifying fulfilling their water requirements of one-quart to one-gallon per animal per day yearlong. The provision of dependable waters in conjunction with improved forage conditions would mitigate some of the present limiting factors for antelope.

Additional waters are proposed to be developed in the Wagon Johnnie, Hot Creek, Reveille, Nyala, Butterfield Springs, and San Antone-Smoky allotments. This would encompass the primary deer ranges, assuring dependable waters to meet daily requirements of one to one-and-a half gallons for deer. Provision of dependable waters in conjunction with the expected overall forage improvement would expand carrying capacity of big game ranges, and possibly relieve, to some extent, livestock dependence on spring and meadow areas for subsequent improvement.

Small Game and Non-Game Mammals

Livestock grazing would alter vegetation structure resulting in reduced food and cover in use areas, to create a mosaic of small mammal populations of differing densities and species. Studies conducted by the U. S. Fish and Wildlife Service Laboratory of small mammals in similar habitat indicate two primary factors accounting for small mammal species diversity and density within vegetative types: foliage height diversity (cover as provided by forage of herb, shrub, and canopy layers) and horizontal diversity within a foliage level. The trampling of rodent dens and reduction of cover and food availability during and following grazing periods would cyclically reduce small mammal populations by an estimated 25 percent in grassland types and 10 percent in shrub-forest areas.

The temporary reduction of habitat quality during and immediately

after grazing is partially offset by the improved habitat conditions realized from the exclusion of livestock on adjacent pastures and the long-term increase in ground cover expected from the proposed moderate grazing level. Since studies indicate that small mammals are most abundant in number and specie diversity in ungrazed or moderately grazed habitat, it is assumed that the proposed moderate grazing intensity would increase small mammal abundance and diversity.

The reduced vegetative cover in use pastures would heighten predator success for the benefit of mammalian and avian predators dependent upon rodents as a food source. The reduced populations following livestock use are expected to regain former density through ingress of animals from ungrazed areas and reproduction of remaining populations.

Fences: The structural developments of water and fences, necessary supportive measures for proposed grazing management, would be largely detrimental to small mammal habitat. Fences would probably have only limited detrimental effect, resulting from vegetation and cover disturbance on approximately 1,028 acres during initial construction. Also, disturbance of approximately 718 acres would occur over the long-term through area occupied and tendency for livestock to trail adjacent to the fence line.

Water Developments: The development of the proposed tanks, troughs,

pipelines, and related facilities would adversely impact small mammalian habitat with short-term loss of vegetation on a total of approximately 232 acres disturbed during construction. There would be permanent disturbance of an estimated 125 acres occupied by tanks, troughs, etc., and the cyclic reduction of vegetation and cover adjacent to watering areas.

The most cyclically detrimental effect of the proposed grazing on small mammals would occur on the estimated 450 acres of habitat adjacent to springs, streams, troughs, etc., which would be subjected to grazing use in an average year. Small mammal habitat is most affected through use of these and adjacent areas, with consequent destruction of ground cover and vegetation, which are required for forage and protective cover.

The livestock impact on habitats adjacent to waters is partially offset by rest periods following use, resulting in an improved small mammal area around water during those periods. The impact of grazing on these areas cannot be eliminated through cyclic rest periods because of the tendency for overuse and subsequent deterioration inherent with most grazing systems or stocking rate. Hormay, Grazing Systems, 1976.)

Birds

Upland Game: Whenever cattle are concentrated in a pasture from May to late July, there would be an adverse impact on sage grouse, chukar, and quail. The eggs of these species would not have hatched yet and there would be an undetermined amount of nest trampling and/or nest abandonment, especially along stream bottoms where cattle use is normally concentrated. Nests are sometimes destroyed outright; at other times, disturbance by livestock causes nest abandonment.

In addition, predation on eggs and young increases as the protective vegetative cover which hides them decreases. Removal of leaves or stems from shrubs and herbaceous vegetation makes nests of these species easier for both ground and aerial predators to see and raid.

Sage grouse - - The proposed grazing systems would affect the life cycle of sage grouse through two basic actions: modification of cover, and the utilization of potential foods. The grazing of habitat utilized by sage grouse would reduce the understory which would result in lower reproductive success as indicated by Grinier (Sage Grouse Life History, 1939), who found nesting success was higher in a dense understory of grass and weeds than a sparse understory.

The grazing of meadows (crucial areas for sage grouse) reduces

vegetation and ground cover, consequently reducing insect abundance which is the primary food for sage grouse chicks. The wet meadows and stream bottom riparian areas are preferred sage grouse brooding areas because of the variety and abundance of food found in such areas. Heavy livestock grazing of these areas would be expected at least one year in every three or four, depending upon the particular system; such use would eliminate the benefits for sage grouse.

An estimated 90 percent of the brooding and nesting habitat (wet meadows, stream bottoms) located on NRL are in poor condition. The cyclic exclusion of livestock from these areas and fencing of selected spring areas are expected to reduce livestock impacts below present levels. The limited improvement realized for at least the period livestock would be excluded would have the following impacts: 1. less nest destruction and/or abandonment and 2. less loss to predation because of better cover and better foraging for young chicks.

The greatest potential threat to sage grouse well-being lies in the proposed land treatment projects. The impacts on this feature of the proposal on sage grouse are discussed under the Land Treatment subsequent to this section.

Chukar Partridge -- Chukar are scattered throughout the unit. With the exception of nest trampling and disturbance, impacts

would be positive as a result of the additional waters developed in areas of chukar habitat. The availability of water, a presently assumed limiting factor in many portions of the study area, would provide for expanded chukar populations, and expansion into new areas.

Scaled Quail and Valley Quail -- Quail populations within the area are limited in numbers and range. No specific impacts from livestock grazing are presently identified.

Waterfowl: The temporary increase in density of cattle per use pasture would result in a more concentrated use of reservoir and stream areas, with resultant vegetative reduction, increased bank erosion; and water contamination from fecal matter and occasional death of livestock adjacent to water areas. Livestock use of riparian vegetation during spring and summer months precludes use by waterfowl because of a lack of cover for nest concealment. Additionally, forage availability of green grass would be reduced as would insects provided by an ungrazed condition.

The grazing system proposed for the Railroad Valley Wildlife Habitat Management Area (WHMA) is designed to periodically renew the vigor of nesting cover by removing old growth and stimulating new growth. This technique would be used to improve nesting cover in this area.

The Railroad WHMA could also be detrimental to optimum waterfowl production, but no long-term impacts would result. Flexibility in the proposed grazing allows for elimination of grazing if wildlife management objectives are not attained.

PRELIMINARY
DRAFT

Raptors (Birds Of Prey): Livestock grazing may in some circumstances be beneficial to raptor populations and in other cases may be detrimental. Under some circumstances, concentrated grazing could make grasslands more suitable for certain small mammals (Stoddart, Smith, Range Management, 1943). Not only are the populations of the prey's mammals high in these situations, but vulnerability to predation is also presumed to be high because of reduced cover. In the case of the burrowing owl, short stature of vegetation is beneficial, and holes created by burrowing mammals such as badgers are a necessity.

However, studies conducted in habitats similar to the Tonopah study area indicate that small mammals were generally abundant in ungrazed or moderately grazed habitat. Thus, it would appear raptors depending upon small mammals as a prey source would benefit indirectly from the proposed systems of moderate grazing through an increased prey abundance.

Stands of aspen (Populus spp) have been identified as critical habitat for birds and many species of raptors in Arizona (Carothers, Johnson, Riparian Habitat, 1975). Greater population densities, and more species diversity were reported for this habitat type than for others in the western United States. Livestock use of these critical habitats would continue with resultant decline in understory vegetation and aspen production. The tendency for livestock to concentrate along stream bottoms, the primary areas of aspen stands, would continue utilization of young aspen shoots

resulting in limited reproduction and eventual diminishment of those stands accessible to livestock use. In the riparian habitat dozens of species would face certain elimination in the event of total loss of riparian vegetation..

Most riparian habitats and aspen stands accessible to livestock are in generally poor condition. While objective data on impacts of livestock grazing on aspen stands are lacking, it is estimated that the proposed concentration of livestock would likely continue the present poor condition, and continue the long-term decrease in habitat available to the raptors such as red tailed hawks, great horned owls, and sparrow hawks which depend on aspen stands for nest sites and hunting perches.

Fences -- Fences or other elevated structures would have little or no detrimental effect on raptor habitat and may, in fact, improve conditions by providing hunting perches.

PRELIMINARY
DRAFT

Non-Game Birds: The concentrated grazing of the proposed action would alter vegetation relative to reduced food and cover, in addition to adversely affecting the productivity of ground nesting birds through exposing or trampling of nests. Since many of the birds utilizing the study

or tampling of nests. Since many of the birds utilizing the study

area appear to select habitat largely in terms of vegetative structure, grazing can be expected to modify bird species composition and density. Confinement of grazing use to some pastures and exclusion from others would sharpen the differences between adjacent plant communities, thus creating a local mosaic of avian communities. differing in species composition, and density. Studies by Owens and Myers (Effects of Agriculture, 1973) found that moderate cattle grazing of grasslands reduced populations of Baird's sparrow, did not affect the populations of Savannah and clay-colored sparrows and western meadowlarks, and permitted ingress of horned larks. The implementation of rest-rotation grazing systems is not expected to absolutely destroy avian habitats, but it would modify or alter the vegetation and associated avian community. The change is detrimental or advantageous relative to some desired distribution of avian communities through time and space, with a net overall increase in species diversity and density to be expected.

The spring and summer grazing of approximately 1,693,435 acres in an average year would result in an adverse ffect on many species of ground and shrub nesting birds, such as scaled quail, meadowlarks, horned larks, killdeer, and vesper sparrows. Impacts of

grazing would include: 1. some nest trampling and/or nest abandonment, and 2. additional loss to predators through heightened visibility with decreasing ground cover.

Some birds would attempt to renest if their eggs or nest were destroyed. Renesting depends partly upon time of year, weather, food supply, disturbance sources, and other factors. A positive effect to be expected from the rest-rotation grazing would be a reversal of the present grazing practices which often promote shrub invasion, thus benefiting the seven species of generally grassland-inhabiting birds noted in the area to the detriment of the 46 shrub land species. Studies suggest that the study area is important habitat for overwintering migrants from northern breeding grounds. The implementation of the proposed management designed to restore a more natural grassland situation could avoid changes in migratory patterns or further population decline of grassland birds.

The implementation of the proposed grazing systems would have a positive impact on birds of the study area through exclusion of approximately two-thirds the total area from grazing during the summer nesting period. At least 3,877,075 acres would be free of livestock for any given summer period to avoid conflicts during this critical nesting season.

The overall effect of moderate grazing would be only slight and possibly beneficial because of a general resiliency of rangeland

faunas, resulting from an ability to shift areas of use, and evolution in association with large grazing animals (Wein, Study of Grassland Birds, 1969).

Fences -- Fences probably have little or no detrimental effect on bird habitat and may, in fact, improve conditions by providing perches for raptors, flycatchers, and shrikes. They would also provide resting areas for other birds, particularly where sagebrush has been removed from the adjacent areas. The same would be true of windmills and storage tanks.

Water Development -- Water developments such as the numerous stock troughs which increase the amount of available water or provide water where none previously existed, are beneficial to bird habitat in some ways and detrimental in others.

A negative impact could result from the attraction of predatory mammals and snakes to an extent that ground nesting birds would not be able to reproduce in the immediate area of new water sources. Probably the most detrimental effects of water development is overuse and resulting deterioration of areas in the vicinity of waters. The regular movement of livestock is not as detrimental as the damage to vegetation caused by the reluctance of livestock to leave the area, especially during the hotter part of the day. The vicinity of water sources commonly become a "loafing" area for livestock where ground cover and bird nesting habitat are

destroyed and trees if they are present, are damaged by rubbing, browsing, and trampling.

The livestock impact on areas around water sources is partially offset by livestock exclusion from approximately one-fourth of all water areas for at least 12 months with the remaining areas utilized for a three-to-five-month period followed by up to 12 months rest. There would be a short-term effect resulting from the reduction of cover and food until vegetation could grow to former size. There would be a continuing residual impact from the concentrated livestock use of these areas with respect to an alteration of vegetation type toward a grass and annual plant type in the immediate vicinity of troughs and watering areas.

Possible beneficial effects, besides the increased availability of water, might be an increase in insects attracted by water, livestock, and manure and the creation of dusting areas.

PRELIMINARY
DRAFT

Invertebrates

Vegetation plays an important role in both distribution and numbers of arthropods beyond that of providing a source of food. Vegetation height, density, and composition all affect arthropod density. A number of studies have recognized the detriment or benefit to various species related to livestock grazing of differing intensities. Pepper (Insect Populations, 1955) reported that almost without exception high population densities of grasshoppers were associated with excessive grazing by livestock, or to a combination of heavy grazing and dry weather. Overgrazing causes many insect species to decline or disappear, but it can enable grasshoppers to increase enormously. Studies on the International Biological Program Grassland Biome revealed consistently greater number of arthropods throughout the season in the permanently ungrazed plots (1971). These data are consistent with those of Morris (Insect Response to No Grazing, 1967-1968) who found that most taxonomic groups he sampled were most common in areas left ungrazed for two to three years. Lightly grazed plots supported greater numbers of arthropods than did moderately or heavily grazed plots. Light grazing of pastures resulted in a buildup of Homoptera (plant-sucking insects) that was maintained throughout the season. Ants were found in smallest numbers in the heavily grazed pasture (Larigone et al., Arthropods under Various Grazing, 1972).

The implementation of management practices designed to enhance vegetation and alleviate overgrazing as proposed, is theorized by

Smith (Effect of Overgrazing, 1940) to be the best overall control of such injurious rangeland insects as grasshoppers and Mormon crickets. There the stocking adjustments and moderate grazing design for increased vegetation production and diversity may provide a beneficial impact of reduced insect damage to desired forages.

The increase in vegetative ground cover and plant vigor to be expected would not eliminate destructive species, but would provide a habitat more favorable to a balance of arthropods and the larger herbivores dependent upon the forage resource. The increased overall species diversity of arthropods to be expected from an improved range condition of increased plant diversity and production would strengthen that component of the food chain for the myriad of small mammals and birds which seasonally depend upon this high protein food source.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Land Treatments

The proposed conversion of 39,760 acreas of sagebrush, and 2,650 acres of pinyon-juniper-sagebrush type to primarily grasses through use of herbicides and chainingwould affect the complete spectrum of wildlife utilizing these sites and adjacent habitats. Eight allotments -- Hot Creek, Stone Cabin, Ralston-Monitor, Hunts Canyon, Francisco, Darrough, Hot Springs, Ione, and Willow Creek -- have proposed vegetative treatments to achieve additional grass forage. While the affected areas would represent less than one percent percent of the total NRL within the Tonopah study area, any habitat alteration from that existing now makes these areas of singular importance in evaluating potential impacts.

The wildlife species closely associated with sagebrush habitat, such as sage sparrows, Brewer's sparrows, sage grouse, sagebrush lizards, sagebrush voles, etc. would be eliminated or greatly reduced in the proposed treatment areas. These species are dependent upon the sagebrush type for food and cover and consequently any reductions in total acreage of this type would reduce population levels. In the Darrough Hot Springs allotment the removal of sagebrush would eliminate sage grouse habitat in the affected areas.

The proposed reduction of sagebrush through use of herbicides would have a detrimental effect upon the diversity of bird species dependent upon the middle and lower strata of the sagebrush type. Bird species such as the Brewer's sparrow and Vesper sparrow are

virtually eliminated by total sagebrush eradication. In addition to displacement of habitat selective sparrows and many birds would be affected through loss of required perching or nesting sites provided by sagebrush vegetation (Daubenmire and Daubenmire, Vegetation of Eastern Washington, 1968). Removal or modification of the vegetative strata associated with sagebrush would reduce the diversity of bird species found in the treatment areas for several years until foliage pattern and density once again fits habitat requirements.

However, small irregular areas of sagebrush conversion, as required, would increase the edge effect and thereby the diversity of bird species for the ecotone area (Bell, Slustinski, Habitat Manipulation, 1972).

Small Mammals: The reduction of cover and food sources provided by sagebrush and associated herbaceous vegetation would decrease abundance and diversity of small mammals in the treatment areas. The overall impact is anticipated to be negative in the short-term until treated areas revegetate. The impact would then be positive in the long-term because of an additional edge effect and diversity created through conversion of some of the sage to grassland.

Arthropods: The proposed treatments would effectively eliminate many arthropods from treatment area through loss of food and

cover. The displacement is expected to be of short-term duration with a wide variety of insects immigrating from adjacent untreated areas to capitalize on the emergent regrowth or new plant establishment. The re-establishment of a variety and diversity of arthropods able to utilize the modified habitat would expedite the establishment of birds and small mammals which depend upon arthropods as a food source.

PRELIMINARY
DRAFT

Forage Allocation

The allocation of 14,873 animal units of forage previously licensed for livestock would insure the availability of forage to meet requirements for expanded populations of mule deer, antelope, and bighorn sheep. The reservation of forage in each pasture would provide forage for wildlife in excess of that taken by livestock during use cycles. In addition, wildlife would have ready access to rested pastures where livestock competition would be eliminated.

The reservation of forage would have long-term beneficial impacts on grazing wildlife populations, reducing competition and ensuring the availability of quality forage.

Predator Control

The proposed action of intensive livestock management can be expected to result in continuation of predator control requests from affected operators.

Predators on NRL have been subjected to predator control practices in the past which would continue, depending upon substantiation of need to authorizing personnel of the BLM. The concentration of livestock into smaller areas could conceivably increase predator impact. The proposed grazing systems could adversely impact populations of predators, primarily bobcats and coyotes, through creation of conditions where predator attack on livestock could be more probable resulting in increased rancher requests for control or reduction of potential predators.

Elimination of Grazing

Elimination of grazing would remove any competition for forage or living space between wildlife and livestock. Approximately 32,480 acres would be withdrawn from livestock use. The majority of the area currently supports concentrated mule deer winter use. The restriction of livestock from this area would be expected to markedly improve mule deer habitat which has been subjected to excessive grazing use. The elimination of grazing would be anticipated to result in an overall improvement in browse, as noted in the Morey Bench area where an upward trend was noted because of increase of forage diversity and bitterbrush sprouting which was attributed to discontinued livestock utilization, (Tueller, Monroe, Management Guidelines, 1975). Studies located directly adjacent to the withdrawn areas exhibited 30 percent increases in bitterbrush over an eight year period following exclusion of livestock use. (Tueller, Monroe, Management Guidelines, 1975.) The assumption implied from the Morey Bench studies is that mule deer habitat previously utilized by livestock would improve considerably upon exclusion of cattle use.

The riparian and mesic areas, such as Six Mile Creek and Four Mile Creek, are expected to show immediate and favorable vegetative response upon exclusion of livestock. The concentrated

use of these areas by livestock has resulted in the generally deteriorated condition and subsequent reduced habitat quality for the myriad of small mammals, birds, and insects which inhabit these sites. A primary benefactor of the expected improvement in general habitat condition would be sage grouse which require the meadow and mesic areas in the process of their yearly life cycle. The small meadows and riparian areas provide the critical habitat requirements needed for sage grouse brooding areas. The past diminishment of these sites, directly attributable to over grazing, has been instrumental in past sage grouse decline and present low numbers. The improvement expected upon removal of livestock from the proposed areas would increase sage grouse populations utilizing these areas and enhancing overall habitat for the complete spectrum of wildlife from mule deer to small rodents which utilize these highly restricted habitats.

Aquatic Life

General Impacts: The impact of livestock grazing on aquatic life and associated habitat is dependent on the number of grazing animals per unit of area and the season and duration of use. The lack of water and sparse vegetation on much of the Tonopah study area causes livestock to concentrate on the riparian habitat for water, shade, and forage. When the grazing season extends more than two to three months, the impact on riparian vegetation is out of proportion to the rest of the pasture.

Fish habitat would be affected the most adversely when the greatest livestock use occurs. Fish habitat and all aquatic life would benefit from periods of rest.

Fish habitat and riparian habitat would deteriorate in the "two pasture systems" or when summer and fall grazing is followed by spring grazing without a period of rest.

All streams, except Six Mile Creek (which is excluded from grazing), would be impacted by livestock grazing. Approximately nine miles of stream on national resource land (NRL) would be affected by grazing. In addition, three creeks, containing 12 miles of stream on national forest land, would be affected.

Most streamside vegetation would be removed by grazing since livestock would be concentrated in smaller pastures than they now are. Removal of low streambank vegetation (grasses, sedges and

shrubs) would cause higher summer water temperatures and eliminate cover for fish. Loss of vegetative bank cover would result in smaller populations of fish as the carrying capacity of streams would be reduced.

The carrying capacity for fish and other aquatic biota (plant and animal life) of a stream, lake, or reservoir is no greater than the capacity of the aquatic habitat at its minimum size. Aquatic organisms and fish are limited to the ecosystem in that they inhabit and cannot move when conditions deteriorate. Over the long run, periods of rest and improved habitat conditions for one year, followed by grazing and poorer conditions for two or three years, would not improve fish populations.

Sedimentation of streambeds would continue from upland areas as described under the soil and water resources section in Chapter III.

Heavy trampling of streambanks would also contribute sediments to streams as well as hinder the re-establishment of plants. Undercut streambanks used by fish as cover in the small streams of the Tonopah study area could be destroyed by trampling and subsequent erosion during high runoff. Streambeds would degrade, leaving vertical, unstable banks. See photo Illustration III-2, of Corcoran Creek. Erosion of streambanks and livestock walking in streams cause unstable stream channels and further sedimentation. Increased sedimentation adversely affects production of trout by lowering survival of eggs and young fish, limiting aquatic food organisms and reducing rearing habitat.

PRELIMINARY
DRAFT

III-2

Photo Illustration

Corcoran

Creek

Illustration III-2.

Vertical stream banks as shown on Corcoran Creek are symptoms of accelerated streambed erosion. Unstable stream banks produce an increase in sediment yield and lower water quality which results in lower fish population.

PRELIMINARY DRAFT

Concentrations of animals along streams results in animal wastes polluting the water. Bacterial counts could become high enough in small streams, such as those in the Tonopah study area, to cause reductions in dissolved oxygen concentration in localized areas. Aquatic life becomes stressed when oxygen levels are low. Fish populations could be reduced because of mortalities suffered by incubating trout eggs or fry (recently hatched fishes) in the gravel.

Livestock walking in the stream could also cause mortality of developing trout eggs in gravel redds (spawning grounds or nests). Fall grazing would cause more of this type of mortality since most of the existing trout population is Eastern Brook and German Browns both of which are fall spawners.

The extent to which the above impact would reduce the fish population is not known. The magnitude of the changes in water quality and physical habitat conditions cannot be quantified as research on the relationship between various grazing systems and fish production have not been conducted. However, adequate research has been done to show that when the physical habitat and water quality is adversely affected, reduced fish populations occur.

Aquatic vegetation would not be removed by livestock and sediment yield would be reduced during those years the pastures were rested. Streams in allotments with a proposed three pasture system would be rested once every third year. Willow Creek is the only two pasture system, but it has three treatments and the riparian vegetation would be rested once every four years. Most of the streams in the Tonopah area are in allotments with four pastures and would be rested once every four years.

Water quality would improve overall because of reduced suspended sediments and the elimination of animal waste from domestic livestock. There would also be less sedimentation of streambeds, less erosion of stream banks, and increased channel stability. Increased stream bank vegetation for cover would lower summer water temperatures. Larger fish populations would result from these improved habitat conditions, but the magnitude of increases cannot be predicted because basic data are not available.

Increased vegetation along stream banks is anticipated by implementation of the proposed grazing systems and is an objective of some allotment management plans. The physical condition of stream banks and associated vegetation are not expected to improve as rapidly as vegetation growing away from water because of continued heavy grazing and trampling. A substantial increase in the growth of streamside vegetation (grasses, sedges, shrubs, or trees) would improve habitat conditions and result in larger fish populations.

Generally, more livestock use would be concentrated in smaller pastures during seasons of use in the three or four pasture systems than occurs now. Since livestock tend to concentrate along streams and water, it may require several years for stream banks to become revegetated and provide the desired benefits to fish habitat. Similar grazing systems have not been in effect long enough to predict how many grazing cycles must be completed before stream banks become stable and maintain satisfactory vegetative cover during all treatments. Because of the poor distribution of water, it would take longer in the Tonopah area than in areas with more abundant water.

Removing vegetation that provides shade to a stream increases water temperatures. An increase in water temperature above 20° C (68° F) for more than a few hours per day would be lethal to all species of trout found in the Tonopah area. Little information is available on stream water temperatures presently; however, some streams such as Barley Creek exceed lethal levels for some species of trout now.

Impacts by Allotment: Specific impacts on the aquatic habitat and fish in the grazing systems designed for each allotment follows:

Blue Eagle and Butterfield Allotments -- The Railroad Valley Wildlife Habitat Management Plan (WHMP) includes all of the major aquatic habitat in the Blue Eagle and Butterfield allotments. These areas are presently fenced and would be used by livestock only to meet the objectives of the WHMP.

No fencing of springs and riparian vegetation is planned for other waters in the Blue Eagle allotment. This would allow heavy use of all water sources in the allotment. Livestock would tend to overuse the areas near water resulting in the trampling and denuding of vegetation in these areas. Increased turbidity, bacterial contamination, and lower quality water would result around the spring areas. This would be true of springs throughout the area if they are not fenced.

Springs in the Butterfield Spring allotment would be fenced. Livestock use around Lockes Spring, Big Spring, Heath Spring, Blind Spring, and upper Blind Spring should not affect water quality and riparian vegetation. Water quality should improve over the existing conditions with implementation of the proposal.

Nyala Allotment -- The Nyala allotment contains Chimney Spring of the Railroad Valley WHMP. This area is not fenced and livestock use would be for two and one-half months each year with the season of use varying annually. (See

PRELIMINARY DRAFT

Appendix A.) The November 16 to Febraury 1 season of use would have the least impact on wildlife and the June 15 to September 1 season of use the most impact. Summer use by livestock would compete with wildlife species such as sage grouse. The Railroad Valley WHMP has a fencing project proposed for Chimney Spring and the development of small ponds for endemic fish.

Hot Creek Allotment -- The proposed fencing of south Six Mile Creek at the mouth of the canyon would eliminate livestock grazing from that drainage. This would result in an improvement in the vegetative cover along the stream. Water quality would be improved and habitat conditions for fish would also improve. An increase of 10 percent in the fish population could be expected with better stream bank cover, less sediment, and lower water temperature.

Wagon Johnnie Allotment -- Water quality in Fish Lake in the Wagon Johnnie allotment is below the range for good fish habitat (see Chapter II, Water Quality section). High salt concentration prevents the establishment of some forms of fish which do not reproduce in the lake.

The pasture would be used each year from September 15 to October 31. Larger amounts of organic material would be entering the lake each spring, during the spring runoff as a result of the livestock use.

Danville Creek and Clear Creek would receive rest one out of four years. The season of use would vary each year. With the earliest use May 1 and the latest September 15, the concentration of livestock would be greater for a shorter period of time. Animal concentration has occurred along Clear Creek under present grazing uses and would continue under the proposed action. Use in either of the first two grazing periods would remove stream bank vegetation

PRELIMINARY DRAFT

and would cause slightly higher water temperatures in August. Since much of the vegetative bank cover would be eliminated by fall, there would be less suitable rearing area for young fish resulting in a smaller fish population.

Danville Creek in pasture four has more area and available forage. This allows for a slightly lower concentration of livestock on the riparian vegetation. The stream is in good condition now. It would show some decline in suitable habitat in the years it is grazed early but would show improvement when used late or rested. If predicted increases in vegetative cover result and the objectives of the Allotment Management Plan (AMP) to limit utilization of riparian and meadow vegetation from exceeding 50 percent is met, stream bank vegetation would be improved. This would result in better cover for fish, less sediment, and improved water quality resulting in an increased fish population.

Ralston-Monitor Allotments -- There are three miles of fish habitat in the Ralston-Monitor allotments. The four pasture rest-rotation system allows for complete rest one out of four years. The pastures would be used after July 1 for 36 days each year. The short-term impacts would be similar to those described for the stream in the Wagon Johnnie allotment.

PRELIMINARY DRAFT

Most adverse impacts would be eliminated before the end of 15 years as predicted vegetative and soils conditions improve.

Hunt's Canyon Allotment -- Barley Creek in the Hunt's Canyon allotment would be grazed each fall for two months as livestock are moved off the forest. Therefore, probability of over-utilization in pasture four is high if all livestock are left in this pasture until December 1 each year. There is little stream bank vegetation present now. Stream banks would continue to erode, poor water quality as a result of animal wastes and sediment would continue, and there would be no improvement in the fish population. Hunt's Canyon Creek would also be adversely impacted. Vegetation on stream banks is lacking now and would not become re-established under the grazing system as designed.

A spray project on 1,400 acres is proposed on the north side of Barley Creek. This would have an adverse impact if a wide buffer strip is not left between the spray project and the stream.

The AMP proposes to control livestock distribution by water control. This would have an adverse impact on all riparian vegetation. Wildlife populations would be forced to shift with the livestock for water. This would increase competition for forage and result in lower wildlife populations.

Francisco, Darrough Hot Sptrings, Ione, Willow Creek Allotments -- The Francisco, Darrough Hot Springs, Ione, and Willow Creek allotments contain no fisheries habitat at the present time. They do contain valuable riparian habitats that support terrestrial wildlife that would be impacted by livestock grazing. (See the terrestrial section.)

PRELIMINARY DRAFT

San Antone Allotment -- The San Antone Allotment contains slightly over 10 miles of stream and one reservoir. The three pasture system would allow one year's rest every three years with a four month season of use.

The division fence between the Manhatten and Cloverdale pastures is designed to go along Peavine Creek. This would not allow for a year's rest within the Peavine drainage since livestock would be in part of the drainage every year. Livestock use would be heavily concentrated near the stream. Trampling of stream banks would increase. Vegetation would be reduced with increased erosion of streambeds, increased water temperatures, and poor survival of fish eggs deposited in the streambed gravels. This would result in lower fish populations. There would be an overall reduction in the quality of the fish habitat and water quality with the presently designed pastures. Water quality in Saylor Reservoir would decline, since it is filled by diverting water from Peavine Creek.

Moores Creek and Shipley Creek (Baker Creek) are in fair to good condition and should show some improvement over the 15 years when predicted vegetation and soil conditions improve. The November through February grazing season would have slightly less impact than the March through June season.

North Twin River is diverted into a cement-lined ditch shortly after it leaves national forest lands. Conditions in the cement-lined ditch would not improve regardless of whether or not the proposed grazing system is implemented. The unlined stream would receive impact similar to those described for Wagon Johnnie.

See Table III-4, for a summary of short- and long-term impacts on aquatic habitats in the Tonopah study area.

PRELIMINARY DRAFT

TABLE III-4

ESTIMATED SHORT-TERM AND LONG-TERM IMPACTS OF LIVESTOCK GRAZING BY ALLOTMENT ON THE MAJOR AQUATIC HABITATS IN THE TONOPAH UNIT

Allotment	Fish Habitat and Major Aquatic Habitat	Number Pastures	Years Rest	Miles/ Acres	Impacts Short-Term*	Impacts Long-Term*
Blue Eagle	Blue Eagle Spring of Railroad Valley HMP	5	1 in 3	30 Ac	0	0
Butterfield	Lockes Pond and Big Well - Railroad Valley HMP	4	1 in 4	452 Ac	0	0
Nyala	Chimney Springs Area - Railroad Valley HMP	4	1 in 4	30 Ac	0	0
	Troy Canyon			1 Mi	-	+
Reveille	Echo Canyon Reservoir and Twin Springs Slough	4	1 in 4	10 Ac	-	-
Hot Creek	Six Mile Creek	5		6 Mi	+	+
	Lockes Ranch Hot Spring					
Wagon Johnnie	Little Fish Lake	5	1 in 4	80 Ac	-	-
	Clear Creek and Danville Creek			4.7 Mi	-	-
Stone Cabin	Stone Cabin Reservoir (no fish)	6	1 in 4		-	-
Ralston-Monitor	Mosquito Creek	4	1 in 4	1 Mi	+	+
	Pine Creek			.5 Mi	+	+
	Corcoran Creek			1 Mi	+	+
	Meadow Creek			.5 Mi	+	+
	Morgan Creek (no fish)			.5 Mi	+	+
Hunt's Canyon	Hunt's Canyon Creek	4	0	.5 Mi	-	-
	Barley Creek			1 Mi	-	-
Francisco	(None)	4	1		-	+
Darrough Hot Springs	Marsh Area (no fish)	4	0		-	+
Ione	(no fish)					
San Antone	Peavine Creek	3	0	9 Mi	-	-
	North Twin River		1 in 3	¼ Mi	+	+
	Barker Creek (Shipley Creek)		1 in 3	.5 Mi	+	+
	Moores Creek		1 in 3	.5 Mi	+	+
	Seylor Reservoir		1 in 3	10 Ac	-	-
Willow Creek	Willow Creek (no fish)	2	1 in 4		-	-
				Areas of no change	512 Ac	512 Ac
				Areas of improved habitat condition	10.7 Mi	11.7 Mi
				Areas of degradation	16.2 Mi	15.2 Mi

* 0 indicates - No change
\+ indicates - Improved habitat conditions
\- indicates - Degradation of habitat conditions

Wild Horses

The Tonopah Management Framework Plan (MFP) identifies five herd areas where wild horses will be managed. The intensity of management is also described in the MFP. A sixth area (Saulsbury) is identified where wild horses may be managed, depending on whether or not it is determined horses existed in this area as of the passage of the Wild Horse and Burro Act. (If horses were not in the area, they do not fall under the purview of the Act, and are not legally wild horses.) For the purpose of this analysis it is assumed that this will be a herd management area. Chapter II of this statement describes two herd areas (North Willow Creek and Hunt's Canyon) which are not treated by the MFP. The North Willow Creek area was not treated because it is administered by the U. S. Forest Service under an interagency agreement and because the management plan for this allotment is considered implemented. The Hunt's Canyon horses were not known to exist on national resource land (NRL) until immediately prior to the writing of this statement. These two herd areas are also considered as herd management areas for the purpose of this analysis.

Herd management areas, by allotment, are identified in the table below.

Herd Management Areas	Proposed Allotment
Reveille	Reveille
Little Fish Lake	Wagon Johnnie
Stone Cabin	Stone Cabin

Willow Creek	Willow Creek
Hunt's Canyon	Hunt's Canyon
Park Mountain	Hot Creek
Saulsbury	Hunt's Canyon and Ralston
Monte Cristo	San Antone-Smoky

These herd management areas and the number of horses to be managed in each area are shown on the Herd Use Area Map.

Discussion of impacts on wild horses is catagorized by proposed allotment and further by impacts that would result from the grazing system, the proposed management facilities, and from land treatments. Significant impacts on wild horses are tabularized in Table III-5.

Impacts of the Proposal on Wild Horses

General Impacts: There are two generalized impacts which would occur on all allotments and herd areas; these involve fences and cattleguards. Experience in the Battle Mountain and Winnemucca BLM Districts, Nevada (Christensen and Hoem, personal communications, 1976) and in the Vale District, Oregon (Wilcox, personal communications, 1976), indicates that wild horses, in some instances, run into or through newly constructed fences which cross established routes of travel. The apparent reason is that the fences are not seen, or the horses do not percieve them as a barrier. After learning of a fence location,

PRELIMINARY DRAFT

TABLE II
IMPACTS OF THE PROPOSAL ON WILD HORSES

Allotment	Herd Management Area	Cause	Impact
Reveille	Reveille	Grazing system.	Long-term improvement in forage quality which could result in improved health and productivity.
		Removal of horses from pastures 2 and 4 and removal of horses from critical deer summer range in Kawich Range.	Long-term and short-term removal of horses from historic use areas.
		Cedar pipeline fence, exterior gap fence near Bellhelen.	Short-term hazard for entanglement and/or injuries from running into fence.
			Long-term disruption of established movement patterns and restriction of free-roaming movement.
		West extension of Cedar pipeline.	Long-term improvement of habitat through improved water distribution and increased availability.
		Lack of provision for water from private sources.	Short-term physiological stress from thirst and/or from crowding into available waters; changes in normal habits and patterns of movement; death from thirst.
			Long-term extinction or great reduction in herd population.

PRELIMINARY DRAFT

TABLE III
IMPACTS OF THE PROPOSAL ON WILD HORSES

Allotment	Herd Management Area	Cause	Impact
Hot Creek	Park Mountain	North allotment boundary fence.	Short-term hazard for entanglement and/or injuries from running into fence.
Wagon Johnnie	Little Fish Lake	Forest boundary fence and monitor gap fences.	Short-term hazard for entanglement and/or injuries from running into fence.
			Long-term restraint of free-roaming behavior; possible restriction of seasonal drift; change in normal patterns of movement.
Stone Cabin	Stone Cabin Willow Creek	Grazing system.	Long-term improvement in forage quality which could result in improved health and increased productivity.
		All proposed fences.	Short-term hazard for entanglement and/or injury from running into fence.
			Short-term increase in physiological stress from relative confinement and possible increased competition between stallions for space.
			Long-term separation of the Stone Cabin herd into two units; elimination of movements across U. S. Highway 6.
			Long-term restraint of free-roaming behavior; obstruction of seasonal movements; change in normal patterns of movement and behavior.

PRELIMINARY DRAFT

TABLE III-5
IMPACTS OF THE PROPOSAL ON WILD HORSES

Allotment	Herd Management Area	Cause	Impact
Stone Cabin (cont.)	Stone Cabin Willow Creek (cont.)	Water developments.	Long-term improvement of habitat from increased water availability and improved distribution; broadened or additional areas of use; water lot around highway reservoir and Taylor Well could cause thirst, disruption of normal havior and movement patterns (See narrative).
		Land treatment.	Short-term disturbance of animals from low-flying aircraft during herbicide application.
			Long-term improvement in quality and quantity of forage, which could result in improved health and increased productivity.
Ralston-Monitor	Hunts Canyon		No impacts.
Ralston-Monitor	Saulsbury	No formal allocation of forage.	No impacts.
		McKinney tanks gap fence and Highway 6 fence.	Short-term hazard for entanglement and/or injury from running into fences.
			Long-term separation of the herd into two units; elimination of movement across Highway 6; restriction of free-roaming behavior; possible entrapment of horses during grazing season in Baxter Springs pasture south of Highway 6 and possible physiological stress from thirst.

PRELIMINARY DRAFT

TABLE III-5
IMPACTS OF THE PROPOSAL ON WILD HORSES

Allotment	Herd Management Area	Cause	Impact
Ralston-Monitor (cont.)	Saulsbury (cont.)	McKinney tanks and Cedar Corral pipelines.	Short-term and long-term improvement of habitat through increased water availability and improved distribution.
Willow Creek	North Willow Creek	All pipelines.	Short-term and long-term improvement in habitat through increased water availability and improved distribution.
San Antone-Smoky	Monte Cristo	Dunes-Cloverdale fence.	Short-term hazard for entanglement and/or injury from running into fence. Short-term and long-term obstruction of free-roaming behavior. Long-term possible separation of the herd into two units; alteration of seasonal movement.

and perceiving the fact that it is indeed a barrier, wild horses normally will not run into or through a fence (Christensen, Hoem, Wilcox, personal communications, 1976). In areas where fences already exist, wild horses seem to be wary of new fence construction and suffer fewer fence-related accidents than do horses in areas which have few or no fences. No fatalities have been documented of horses running into fences in the Battle Mountain District. However, severe and minor cuts have been noted on horses in areas where fences have been recently built and damaged by wild horses (Hoem, personal communication, 1976).

Cattleguards are a different kind of obstacle to wild horses in that they are apparently recognized as an obstruction and can be easily seen. Experience in Nevada (BLM report concerning Hazards of Cattleguards, 1976) indicates that wild horses will not attempt to cross cattleguards unless under severe stress, such as extreme thirst or fright. It seems probable that wild horses attempting to cross a cattleguard they are not aware of which has become covered with snow may become caught. Horses which do get caught in cattleguards usually break one or both front legs and die. If discovered soon enough they are humanely destroyed.

Impacts by Allotment

The specific impacts of the proposal on wild horses in each allotment are as follows:

Reveille Allotment: In the Reveille allotment, the primary impacts would be from the provisions of the grazing system and from lack of provision for water. The grazing system calls for removal of horses from areas historically inhabited by wild horses (parts of the Kawich Range and from the east slope of the Reveille Range). The Cedar Pipeline Ranch fence would, in part, restrict movement of wild horses into an historical use area. Improved range management practices resulting from implementation of the grazing system would provide long-term improvement in the quality of forage for wild horses. This could, in turn, result in general improvement in the health and productivity of the herd. Most of the water in this allotment is privately controlled. If these water sources were suddenly made unavailable to wild horses, upon the prerogative of the owner, the Reveille herd would practically be eliminated. Certain of the proposed fences would eliminate established movement of wild horses around the southern end of the Reveille Range and over the top of the Kawich Range. The importance of this drift as part of the yearlong habitat or life history of the horses involved is, however, currently unknown.

Hot Creek Allotment: The Park Mountain herd of wild horses is located in the Hot Creek allotment. The allotment boundary fences proposed to be built in this herd use area would create short-term adverse impacts. Immediately following construction, the fences would obstruct the

movements of these horses. Upon learning the fences are open-ended (not continuous or connected to another fence) the affected individual horses or bands would detour any blocked routes of travel and go around the fences.

Wagon Johnnie Allotment: Boundary and gap fences proposed for the Wagon Johnnie allotment would to a limited degree adversely affect the Little Fish Lake herd. These fences would be across established routes of travel used for seasonal migration and for day-to-day random movement of some individual bands. Horses would move around the gaps during periods of stress, such as when pushed to lower elevations by heavy snows. The nature of the grazing system, in addition to the provision that all gates would be open when not needed for control of cattle, would allow seasonal drift on and off the allotment through the proposed fences, except for years of extreme weather conditions. In the fall all gates would be open by October 31. During spring, in two years out of four, all gates to the higher elevations would be open until June 15 or later. During years when late snows coincides with the May 1 start of grazing in one of the west side pastures, wild horses may be blocked from moving through the fences to higher elevations. Late snows could keep these horses below the proposed fence, until after May 1. When the grazing season starts in one of these pastures the gates to the adjacent national forest would be closed.

Stone Cabin Allotment: In the Stone Cabin allotment all three components would affect wild horses: the grazing system, proposed management facilities, and land-treatment practices. Improved range management practices resulting from the proposed grazing system would provide long-term improvement in the quality of forage for wild horses. This could result in healthier individuals and a more productive herd.

The proposed fences would eliminate the north-south seasonal drift of wild horses across U. S. Highway 6 and to some degree disrupt the seasonal movement of the Willow Creek herd on and off the national forest. Random free-roaming movements of these animals would be obstructed, especially those bands occupying an area near a fence. The nature of the grazing system, in addition to the provision that gates would be open when not needed for control of cattle, would provide for seasonal drift on and off the national forest and for some random free-roaming movement across fence lines. Normal drift to higher elevation would be blocked during years when late snows coincide with an early start of grazing (April 10) in one of the west side pastures. During two years out of four, gates to the higher country would remain open until May 10. In the fall, gates to the national forest would be opened no later than October 31, allowing movement to the lower elevations.

Proposed water developments would impose a generally beneficial impact on the wild horse populations as a result of improved dis-

tribution and increased amount of water available. The water lots proposed around Taylor Well and the Highway Reservoir are the exception. These waters would be unavailable part of the time to some horses, causing increased physiological stress. Thirsty horses could break down or run through the water lot fence causing injury to themselves. Forcing horses to drink at fewer places (other nearby waters) could also cause increased physiological stress from crowding and increased competition for space between stallions. Whether other nearby waters would be available would depend upon climatic factors. For example, if ample snow and/or meltwater is available during the time Taylor Well is shut off to one side of the fence, no adverse effects would result. During a dry period when these waters are shut off to one pasture, some horses may die of thirst, and/or may break down the fence.

Land Treatment proposed in the Stone Cabin allotment would result in improved forage quality and increased quantity for wild horses, providing a favorable impact similar to that of the grazing system.

Common herbicides, such as 2,4-D, are not toxic to horses when injested from grazing treated plants (Valentine, Range Development, Improvements,1974), though they do improve the palatability of poisonous plants for a short time after treatment. This could result in increased consumption of these plants if they exist on the treated area, and consequent poisoning of wild horses.

PRELIMINARY DRAFT

Ralston-Monitor Allotment: In the Ralston-Monitor allotment, no allocation of forage is proposed for the Saulsbury herd. While this would cause a long-term static or declining trend in range condition from the over-obligation of forage, no detrimental effect would result to these horses.

Construction of the U. S. Highway 6 fence would effectively split this herd in two, eliminating any north-south movement of animals across U. S. Highway 6. The McKinney Tanks Gap Fence may trap horses in the area of the Baxter Springs pasture south of U. S. Highway 6 whenever cattle are grazing on either side of the fence. This entrapment would block free-roaming movement of the animals. Physiological stress from hunger or thirst, however, would stimulate movement around the gaps to more favorable habitat.

The lack of provision for water for wild horses in the proposal could cause an adverse impact on the Saulsbury herd. Most of the waters in this use area are privately controlled. If, upon the prerogative of the owner, these waters become unavailable to wild horses, the long-term population of this herd could decline to the point commensurate with available water. In the short-term,the horses would have to move south into new territory next to the Nellis Air Force Gunnery and Bombing Range fence or into the McKinney Tank pipeline area for water. Physiological stress from thirst and/or crowding could cause some bands or individuals to break down or run through fences to find water and/or space.

The McKinney Tanks and Cedar Corral Pipelines would favorably affect the horses in this allotment by improving their habitat through increased water availability and improved distribution.

San Antone-Smoky Allotment: In the San Antone-Smoky allotment, the Dunes-Cloverdale fence would adversely effect the Monte Cristo herd of wild horses. This fence would skirt the east edge of the Monte Cristo herd use area. If horses happened to be east of the fence during construction, they would be effectively separated from the rest of the herd. Seasonal drift of the separated individuals or bands onto the Monte Cristo Range would be blocked. New seasonal use areas for these horses would have to be established. Whatever movement there is of the main herd down onto the alluvial fans east of the Monte Cristo Range would be blocked. Whether this would create a significant adverse impact, is unknown.

PRELIMINARY
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PRELIMINARY DRAFT

Visual Resources

Adverse impacts on visual resources in the Tonopah study area were determined by estimating the amount of visual contrast caused by components of the proposed action within each Visual Resource Management (VRM) Class. Management classes are discussed in Chapter II, Visual Resources. The Visual Resource Management Classes Map shows the locations of the various classes in the study area.

The degree and nature of impacts upon visual resources resulting from grazing systems, management facilities, or land treatment measures depends upon contrasts between proposed activities and the existing landscape character. Contrast was measured by calculating the magnitude of change from the basic visual elements (form, line, color, and texture) for major landscape features (land or water surface, vegetation, and structures). Impacts were measured in terms of the magnitude of contrast created, and by determining if the proposals (grazing systems, fences, or seedings, for example) meet the requirements of the VRM class for the area affected. Components of the proposed action which would not meet the established VRM Class requirements are listed in Table III-6, Visual Impacts on-VRM Classes. Impacts were based on short-term effects, which include the temporary effects from the use of construction equipment and the resultant loss of vegetation and visible soil disturbances whenever equipment is used off existing roads.

Factors considered when analyzing impacts included:

TABLE VII
VISUAL IMPACTS
ON VRM CLASSES

Table will show: 1. proposed facilities and land treatments by allotments, 2. the VRM classes and 3. the relative impacts of the proposal on the VRM classes.

PRELIMINARY DRAFT

1. Distance from which the project will be viewed.

2. The angle between the viewers line-of-sight and the slope being viewed. As this angle nears 90°, the maximum area is viewable and becomes most critical.

3. Length of time the project is in view. If the viewer has only a brief glimpse of the project, the contrast can almost be disregarded. If the project is subject to view for a long period, as from a viewpoint or highway, the opportunity to detect contrast becomes very critical.

4. Relative size or scale of the project in relation to its surroundings.

5. Season of the year and the effects of seasonal changes, considering the heavy or most critical use season.

6. Light and how it will affect the project being viewed.

7. The effect time has on the healing process. Few projects can be expected to meet the visual classes immediately upon completion. With some long-term projects, such as a seeding, it may be desirable to have both short-term (five years) and long-term objectives (completion of the project, or 15 years).

Contrast ratings were calculated by using numerical values for each basic landscape element, varying from a high of four for form, to one for texture. By quantifying the degree of contrast from none at all to strong, a direct multiplier was set up to determine a numerical value for the contrasts (impacts) of a proposed action component in any one VRM Class. Appendix I, containing the Visual Contrast Rating Criteria, shows the methodology of applying the numerical multipliers in accordance with the Bureau of Land Management (BLM) Manual 6230, Visual Resource Contrast Rating.

Contrast ratings were applied to each component of the proposed action within each of three landscape character types. Landscape character types analyzed were valley floors, alluvial fan-foothill zones, and mountain-canyon areas. The total contrast rating score for land surface features, vegetation features, and structure features is not as important in terms of impacts as the score for any one feature, since those elements of form, line, color, or texture which are subject to the highest degree of contrast can be readily identified for possible mitigation.

Contrast ratings were analyzed in terms of meeting established Management Framework Plan Visual Resource Management Classes assigned to the area affected. Bureau of Land Management Manual 6320. Visual Resource Contrast Rating, outlines the standards for each VRM Class as shown below:

PRELIMINARY DRAFT

1. Class I. The contrast rating for any one element may not exceed 1 (weak) and the total contrast rating for any feature must be less than 10.

2. Class II. The contrast rating for any one element should not exceed 2 (moderate) and the total contrast rating for any feature may not exceed 10.

3. Class III. The contrast rating for any one element should not exceed 2 (moderate) and the total contrast rating for any feature may not exceed 16.

4. Class IV. The total contrast rating for any feature should not exceed 20.

Impacts of the Proposal

Grazing Systems: Subtle line, color, and texture contrasts would occur between rested and intensively grazed pastures, and would be especially noticeable directly along boundaries during the first one to five years after implementation of each AMP. As vegetation responds to grazing systems, or within six to fifteen years after AMP implementation, overall appearance of the range would improve. However, there would continue to be subtle differences between rested and grazed pastures, and visible trails would show beside fence lines even though the long-term effect would be improved range condition.

Livestock movements and concentrations within view of travel routes would add an element of activity to the affected landscapes. The presence of relatively higher concentrations of livestock and the possibility of viewing their movements between pastures would create only temporary effects and would not exceed the contrast rating for any of the four VRM Classes.

Management Facilities: Fences generally would not conform to natural colors, lines, or forms found in the existing landscapes. One exception would be the road right-of-way fences, which would parallel the often monotonous axis of highway alignments. Contrasts of proposed fence construction would be most noticeable to observers who are aware of the relative absence of man-made features in the existing landscapes, and would be sensitive to new intrusions upon views.

Table III-6 , Adverse Impacts on VRM Classes, lists the allotments where the VRM Classes would be exceeded. Generally, highest impacts would occur where fences cross travel routes or public use areas. Fences would not actually block views from highways or roads, and in some cases would not appear to be compatible with horizontal lines or "edges" in the landscape as seen in flat valley floors and along mountain bases.

Fence construction activities, equipment, and right-of-way disturbances would create temporary visual intrusions during the

construction periods. Construction schedules would correspond to the AMP implementation schedule shown in Chapter I. Since construction activities would be of relatively short duration in any one location, they would not be expected to exceed any of the VRM Classes for the study area.

Water Development: Windmills have the highest contrast ratings of all management facilities. They do not conform with any characteristic landscape features analyzed, and they exceed the VRM Class objectives in all cases. However, windmills would also be considered a positive impact in monotonous valley landscapes, since they add elements of visual variety, human interest, motion, and even sound. Windmills are commonly associated with the rural West and ranch lifestyles, a concept which would no doubt be appreciated by many viewers. Because they take their power directly from nature and do not pollute, windmills are among the few machines that seem to fit harmoniously in relatively undeveloped rangeland landscapes of the Tonopah study area.

Water storage tanks rate second to windmills in contrast scores. They contrast most strongly in form, since their cylindrical shape would not conform to natural landscape features.

Wells, pumpjacks, buried pipelines, and water troughs would result in relatively less visual impact than windmills and tanks, according to contrast scores. Spring developments, including fencing,

would allow vegetation to increase within the enclosures to add elements of texture and color.

Cattleguards: Cattleguards would cause strong form and color contrasts with land and vegetation features. Less contrast would occur for structures since roads and fences associated with cattleguards would also be intrusive elements. Cattleguards would form focal points for fence crossings and roads, and would attract attention and dominate the foreground views.

Land Treatment Measures: Contrast rating for proposed spraying, chaining, and reseeding measures would not meet VRM Class objectives for treatments over acres. Pinyon-juniper chaining on Toiyabe National Forest land within the Willow Creek allotment would result in high contrasts with the characteristic vegetation patterns.

Cultural Resources

The following discussion describes the potential impacts on cultural resources. The proposed action described in Chapter I and assumptions stated at the beginning of Chapter IV includes measures to protect cultural values. The assessment of potential impact involves consideration of the mitigating measures included in the proposed action and assumptions.

Several additional guidelines were used to direct the impact analysis, evolving from the nature of available data. First, the impact analysis is based on present inventory of known sites, including the archaeological survey of springs, but without surveys to locate and evaluate unknown resources which may be impacted. Thus, potential impacts on cultural resources is based on inventory of less than one percent of the study area. Second, because archaeological and/or historical sites were found at 83 percent of these spring sites surveyed, it is assumed that the degree of impact would be higher where water-related developments are proposed or water-related environments occur. This is assumed for both known and unknown resources. Finally, impacts on known resources are predicted without the benefit of site-specific

project locations within the general areas of analysis.

A summary of factors affecting the condition of known cultural resources and site types of known resources on BLM-administered land in the study area is discussed in Chapter II. The degree of impact to cultural resources sites depends on the nature of the cultural resource (historical, prehistorical campsite, lithic scatter, rockshelter, petroglyphs, etc.) and on the degree of disturbance. The general impacts to known and unknown cultural resources are discussed below.

General Source of Impacts

Grazing System: Cultural values would be impacted through management actions relating to season of use and type of grazing use. The effects of the grazing system would include concentration of livestock in pastures for an increased density per unit area, concentration of livestock in some pastures during spring wet periods, and fluctuations in vegetative cover and soil erosion.

Cultural properties could be impacted according to site type. Historic trails could be impacted by movement of cattle on a large scale over the area. Exact location of these trails is unknown at present and quantification of the predicted impact on trails is not possible without further study. Aboriginal and non-aboriginal

structures could be damaged by livestock rubbing and trampling. Petroglyphs and pictographs may be damaged by livestock rubbing. Rockshelters may be inhabited and trampled by livestock. Archaeological sites (campsites, earlyman sites, quarry/workshops, lithic scatter and chipping stations) could be disturbed through horizontal and vertical displacement damage to artifacts, transportation of natural sedimentary deposition, and loss of paleoecological and paleoenvironmental data.

The disturbance of horizontal cultural deposits may result in the loss of intra-site activity patterns and surface features (i.e., historical structures or foundations, prehistoric structures, hearths, middens or refuse heaps, activity areas, etc.).

The disturbance of vertical cultural deposits could result in the loss of the chronological sequence of past natural and cultural deposits, subsurface features, and activity areas.

As total livestock numbers are initially decreased, the overall initial impacts would not be greater than the existing situation. However, the impacts would increase as stocking levels are raised and concentration in pastures results in increased density per unit area. The effects would be cumulative through time, as cultural resources are nonrenewable.

Secondary geologic processes which are accelerated by domestic livestock grazing could also disturb cultural resources.

Vegetative ground cover loss and concentrated livestock use results in accelerated erosion (See Soils). The impacts to cultural resources includes loss of paleoecological data, collapsing of cultural deposits into drainage channels and possible eventual site loss, removal or displacement of natural sedimentary deposit and any cultural material associated with the deposit, and redeposition of sediments causing possible burial of cultural materials. The long-term beneficial effect of the proposed action is expected to decrease soil erosion. There are no current methods of quantification of the effects of improvement in watershed conditions on the present rate of deterioration of cultural resources. Because of the nonrenewable nature of cultural resources, a long-term reduction in erosion would be beneficial to the degree that short-term impacts have not disturbed or destroyed the resource.

The grazing system also results in a need for supplemental water developments. Those cultural properties located at water sources are expected to be highly impacted. In addition, the need for developments which includes construction of pipelines and troughs opens up additional areas which will be heavily grazed, expanding the area of cattle concentration and its subsequent impacts to cultural resources as indicated above.

Monitoring programs for water quality would occur at various springs. Where cultural materials are present at these springs,

ground disturbance resulting in physical alteration of the site and/or vancalism could occur.

Reintroduction of grazing on land treatment areas where cultural resources have been avoided would result in increased grazing density in these areas, impacting cultural resources as a result of that grazing (as discussed above).

The loss or deterioration of cultural resources would result in changing the resource data base. Because cultural resources are nonrenewable, the net effect would be a reduction in the number of these resources, restricting the possibilities of regional cultural research with regard to settlement patterns, ethnobotanical studies, paleoenvironmental studies, historical occupation, and subsistence and other resource uses of the area. Should a major change occur in the theory or methodology of the disciplines that study cultural resources, deterioration of the data base would cripple future potentially valuable research. In addition, the significance of any cultural resource may change in response to new information and techniques; deterioration of the data base would jeopardize the future significance of that resource.

Management Facilities: Cultural values would be directly threatened by construction of facilities, and indirectly impacted by survey and maintenance of the proposed facilities. The effects of construction include

ground disturbance, removal of soil, removal of vegetation, installation of structures, creation of new roads, continued use of present roads, presence of crews and equipment, and operation of that equipment. Archaeological clearance procedures as stated in the proposed action would avoid inadvertent direct adverse impacts resulting from the actual construction of the facilities. Indirect impacts from the construction would still occur. Increased access into areas and increased exposure to the resources, would result in a higher degree of vandalism. The structures themselves could also impact the visual integrity of historic properties.

Continued use of present roads would affect those sites currently disturbed by those roads.

Increased scientific knowledge would result from archaeological surveys conducted for the proposed facilities. Unavoidable salvage of cultural properties may also contribute educational and scientific information. However, the proper recording of information may not be possible because of time and funding limitations.

Survey and maintenance for the proposed construction would result in ground disturbance, creation of new roads, use of existing roads and use of crews and equipment. The impacts on cultural resources may include physical alteration of sites, continued vandalism from increased

access to areas, increased exposure to cultural resource, and continued use of present road through sites.

The primary impacts of survey and construction would be short-term occurring during specific project activities. The secondary impacts of construction and maintenance would be long-term, continuously affecting those resources in a cumulative pattern.

Impacts of the effects of management facilities on historic trails as known resources cannot be site specific without further study and on the ground project inspection as a part of project clearance procedures.

Land Treatments:

Cultural resources could be impacted through actions related to spraying, seeding, and chaining. Where spraying and/or seeding is done by aerial methods, impact to cultural resources would occur from the effects of short-term loss of vegetation and increase in erosion. Where treatment proceeds on-the-ground, the impacts of these procedures include physical alteration of site, including vertical displacement; loss of paleoecological data and environmental context; and displacement of natural sedimentary deposition. Archaeological clearance procedures should prevent inadvertent adverse impacts on cultural resources. Avoidance of these sites may result in

increased vandalism because of their conspicuous appearance and context. These sites would also be subject to grazing after a determined length of time. Loss of environmental context and paleoecological data would still occur.

Impacts of the effects of land treatment on historical trails cannot be site-specific until further study and project clearance procedures are undergone.

Site-Specific Source of Impact

Grazing System: All cultural resource within an allotment pasture could be impacted by the effects of livestock grazing. The number of known cultural resources which could be impacted would equal the total number of sites in that allotment. The one exception is the Hot Creek allotment, containing 13 sites within the proposed Morey Peak Primitive Area and Six Mile Canyon "back country use area" in which livestock grazing would not be allowed by Management Framework Plan decision. Unknown cultural resources which could be impacted would be expected to occur primarily (though not solely) in very high or high probability areas. (See the Probability of Cultural Resources Map.) The degree of impact on these resources is expected to be higher at water-related localities, in pastures where grazing occurs during spring wet periods, in those pastures grazed for the longest period per year, and in those pastures grazed with highest, live-

stock density per unit area.

Table III-7, Source of Impacts, Grazing System, summarizes how these factors could impact cultural resources.

PRELIMINARY DRAFT

TABLE III-7

SOURCE OF IMPACTS-GRAZING SYSTEM
(CULTURAL RESOURCES)

Allotment (by pasture)	Total Number a/ Known Sites	Total Number c/ Spring Sites	Months Grazed per Year	Total Sites b/ Grazed-Spring Season	New Grazing of Previous Seedings	Density of Grazing Live-Stock (in Animal Units per Acre) f/
Blue Eagle	5	1	10	0		.004
Pasture No. 1 (Central)			2.5			
Pasture No. 2 (Trap)	1	1	2.5	0		
Pasture No. 3 (Oil)	1		2.5			
Pasture Winter No. 1			2.5			
Pasture Winter No. 2	3		2.5			
Butterfield	24	12	6.5	0		.003
Pasture No. 1 (Flat)	0		2.2			
Pasture No. 2 (Bench)	6	3	2			
Pasture Winter No. 1 (Mountain)	15	9	2			
Pasture Winter No. 2 (Irwin Canyon)	3		2			
Nyala	19	12	10	0		.004
Pasture No. 1 (Chuck Wagon)	5		2.5			
Pasture No. 2 (Goat Ranch Spring)	1	1	2.5			
Pasture No. 3 (Nyala Place)	3	2	2.5			
Pasture No. 4 (Crow's Nest)	10	9	2.5			
Reveille	16	9	12	16		.004
Pasture No. 1	5	3	4	5 (year 1)		
Pasture No. 2	3	1	4	3 (year 4)		
Pasture No. 3	3	2	4	3 (year 3)		
Pasture No. 4	5	3	4	5 (year 2)		
Hot Creek	71 a/	28	12	32		.004
Pasture No. 1 (Pritchards	21	6	5			
Pasture No. 2 (Hot Creek)	17	3	5			
Pasture No. 3 (Tybo)	21	12	2	20 (year 2)		
Pasture No. 4 (Sand Springs)	3	2	2.5	3 (year 1)		
Pasture No. 5 (Lunar Crater)	9	5	2.5	9 (year 3)		
Wagon Johnnie	30	3 d/	4.5	30	24	.013
Pasture No. 1	1		1.5	1 (year 1)		
Pasture No. 2	0		1.5	0 (year 4)		
Pasture No. 3	25	3	1.5	25 (year 3)		
Pasture No. 4	4		1.5	4 (year 2)		

PRELIMINARY DRAFT

TABLE III-7

SOURCE OF IMPACTS-GRAZING SYSTEM
(CULTURAL RESOURCES)

Allotment (by pasture)	Total Number a/ Known Sites	Total Number c/ Spring Sites	Months Grazed per Year	Total Sites b/ Grazed-Spring Season	New Grazing of Previous Seedings	Density of Grazing Live-Stock (in Animal Units per Acre) f/
Stone Cabin	30	16	12	32		.004
Pasture No. 1	15	8	2.6	15 (year 2,4)		
Pasture No. 2	0		2.6	0		
Pasture No. 3	0		1,3,4,2 (year 1,2,3)	0		
Pasture No. 4	3	2	3,4,2,1 (year 1,2,4)	3 (year 1,4)		
Pasture No. 5	2	1	4,2,1,3 (year 1,3,4)	3 (year 3,4)		
Pasture No. 6	7	2	1,3,4,2 (year 2,3,4)	7 (year 2,3)		
Bellhelen (in pasture 1)	4	3	2.6	4 (year 2,4)		
Monitor (Ralston-Monitor)	5	3	3.5	0		.004
Pasture No. 1 (Mosquito Creek)	2	2	1.1			
Pasture No. 2 (Combination)	0		1.1			
Pasture No. 3 (Pine Creek)	0	1	1.1			
Pasture No. 4 (West Mosquito)	3		1.1			
Ralston (Ralston-Monitor)	36	5	7	36		.004
Pasture No. 1 (Baxter Spring)	6	3	3.5	6 (year 3		
Pasture No. 2 (Sand Hill)	8	0	3.5	8 (year 2)		
Pasture No. 3 (Tonopah)	22	2	3.5	22 (year 1)		
Hunt's Canyon	6	3	6	6		.004
Pasture No. 1 (South)	3	2	2	3 (year 2,3)		
Pasture No. 2 (Middle	1		2	1 (year 1,2)		
Pasture No. 3 (Hunt's)	1		2	1 (year 1,3)		
Pasture No. 4	1	1	e/	1 each year		
Francisco	1	0	12	1		.006
Pasture No. 1 (Pablo)	0	0	3,6,3 (year 1,2,3)	0 (year 1,3)		
Pasture No. 2 (Tailing Ponds)	0	0	6,3,3 (year 1,2,4)	0 (year 2,4)		
Pasture No. 3 (Big Sage)	1	0	3,3,6 (year 1,3,4)	1 (year 1,3)		
Pasture No. 4 (Winterfat)	0	0	3,6,3 (year 2,3,4)	0 (year 2,4)		
Darrough Hot Springs	2	0	8	2		.014
Pasture No. 1	1	0	2.6	1 (year 3)		
Pasture No. 2	0	0	2.6			
Pasture No. 3	0	0	2.6			
Pasture No. 4	1	0	3	1 (year 2,4)		

PRELIMINARY DRAFT

TABLE III-7

SOURCE OF IMPACTS-GRAZING SYSTEM
(CULTURAL RESOURCES)

Allotment (by pasture)	Total Number a/ Known Sites	Total Number c/ Spring Sites	Months Grazed per Year	Total Sites b/ Grazed-Spring Season	New Grazing of Previous Seedings	Density of Grazing Live-Stock (in Animal Units per Acre) f/
Ione	13	6	6	13		.011
Pasture No. 1	5	2	4,5 (year 1,2)	5 (year 2)		
Pasture No. 2	1		5,4 (year 1,3)	1 (year 1)		
Pasture No. 3	7	4	4,5 (year 2,3)	7 (year 3)		
San Antone-Smoky	50	9	8	50		.004
Pasture No. 1 (Manhatten)	5	1	4	5 (year 1)		
Pasture No. 2 (Cloverdale)	14	6	4	14 (year 3)		
Pasture No. 3 (Dunes)	31	2	4	31 (year 2)		
Willow Creek	3	1	4	0		.020
Pasture No. 1 Willow Creek	0	1	2.5,1.5,4 (year 1,3,4)	0		
Pasture No. 2	3	0	4,4,2.5 (year 1,2,3)	0		
Multiple	6					
Total	317	115		198	24	

a/ Total number sites equals total number sites possibly impacted by grazing system except for Hot Creek Allotment which contains 13 sites which will not be grazed under the Management Framework Plan decision to propose Morey Peak Primitive Area and Six Mile Canyon "back country use area".

b/ March, April and/or May.

c/ Includes sites adjacent to live water.

d/ Information not available for 24 sites.

e/ Late spring and early fall.

f/ Computed by following formula: (AUM ÷ months grazed per year per allotment) ÷ 75% total acreage. Figures are not designed to be completely accurate for other purposes but are used to indicate relative density to point out those allotments with the highest density of grazing cattle.

PRELIMINARY DRAFT

For the entire study area, 304 cultural resource sites could be impacted. Of these, four are on the National Register of Historic Places: Tybo Charcoal Kilns (NRL), James Wild Horse Trap (NRL), Belmont (multiple ownership), and Berlin (Nevada State Park System). Five sites are rated S1 and thus considered National Register eligible. These are the townsite of Ione (CrNV-06-348), Mountain View (CrNV-06-330), Mountain View Arrastra (CrNV-06-323), Moore's Station Petroglyphs (Ar27-06-94), and Jumbled Rock Gulch Petroglyphs (Ar27-06-95). The proposed action would constitute adverse effect on these National Register and National Register eligible sites. Recommendation is to prevent livestock grazing of these sites through fencing, pending coordination with other agencies and persons as applicable. (See Mitigating Measures, Chapter IV.) If avoidance of the resource site is not possible and the proposed action is considered reasonable and prudent, compliance with procedures of Section 106 of the National Historic Preservation Act, as amended by Public Law 94-422 and 36 CFR 800, would be documented. Of the remaining sites which could be impacted, a total of 24 sites are rated S2, 25 are rated S3, and 246 are rated SO.

Management Facilities: Site-specific impacts on known cultural resources by the effects of management facilities are indicated by pasture in Table III-8, Source of Impact, Management Facilities. The evaluative rating and site type of these potentially impacted resources is indicated in Table III-8, Site Specific Impacts-Site Rating and Type.

PRELIMINARY DRAFT

TABLE III- 8

SITE SPECIFIC IMPACTS-MANAGEMENT FACILITIES
SITE RATING AND SITE TYPE

Allotment	NR	S1	S2	S3	S0	Total	Early Man	Campsite	Chipping Station Lithic Scatter	Quarry Workshop	Rockshelter	Pictographs Petroglyphs	Aboriginal Structure	Non-Aboriginal Structure	Trails	Contemporary Resources	Other	Undetermined
Blue Eagle					1	1										1		
Butterfield			2		8	10		5	2	1	1	1		2				1
Nyala					8	8		3	1									6
Reveille				1		1								1				
Hot Creek		1	1	1	12	15		4	4				1	6				2
Wagon Johnnie					4	4		2	1					1				
Stone Cabin					2	2		2			1							
Ralston-Monitor					10	10	2	2	1		2			1		1	1	
Hunt's Canyon					3	3		1	1					1				
Francisco						0												
Darrough Hot Springs					2	2		1						1				
Ione	1			1	3	5		1			1		1	3				1
San Antone-Smoky					8	8		4	2					2				1
Willow Creek					2	2		2										
Multiple					1	1a/									a/			
Total	1	1	3	3	64	72	2	27	12	1	5	1	2	18	a/	2	1	11
Total Sites of Specific Component in Study Area	4	3	30	27	253	317	44	75	67	7	20	6	4	84	3	6	1	28
Percent of Total Above	25%	33.3%	10%	11.1%	24.9	22.4	4.5%	36%	17.9%	14.3%	25%	16.7	50%	21.4		33.3%	100%	29.3

a/ Unknown pending further study and project clearance procedures.

For the entire study area, a total of 72 cultural resource sites could be impacted. Of these, one is listed on the National Register of Historic Places: the townsite of Berlin would be impacted by the construction of an allotment boundary fenceline through the property. This site is administered by the Nevada State Parks System. Two sites are rated S1 and scheduled for nomination to the National Register: the historic site of Mountain View and the nearby Mountain View arrastra ruins. The site of Mountain View itself would be impacted by construction of a gap fence located just south of Mountain View Canyon; the construction of the fence would impact the visual integrity of the arrastra ruins. Thus, the proposed action would constitute an adverse effection on these National Register and National Register eligible sites. Recommendation is to eliminate construction of the fenceline through the town of Berlin pending coordination between the Bureau of Land Management and the Nevada State Park System, and to eliminate construction of the gap fence through the site of Mountain View pending coordination of construction with fencing of the entire historical area (see Mitigating Measures, Chapter IV). If avoidance of the resource sites is not possible and the proposed action is considered reasonable and prudent, procedures pursuant to Section 106 of the National Historic Preservation Act, as amended by Public Law 94-422 and 36 CFR 800, would be documented. Of the remaining sites impacted, three are rated S2, three are rated S3, and 64 are rated SO.

Fifty-nine sites are located on NRL, seven are on national forest land, two are located on both NRL and private lands, one is located on both NRL and State of Nevada lands, one is located on both NRL and national forest lands, two are located on the Yomba Indian Reservation, and three are located on other private lands.

Site-specific impacts on unknown cultural resources would be assessed by archaeological survey on all project activities.

It is expected that those cultural resource sites impacted by management facility-related actions would be most likely to be impacted by vandalism. (Quantification of this vandalism is not available with present methods.)

Land Treatment: Known cultural resources impacted by the effects of chaining, spraying, and seeding are shown in Table III-9, Land Treatments. Unknown resources which could be impacted would be expected to occur primarily in very high or high probability areas within these land treatment areas. At least three known cultural resources are located in areas proposed for land treatment.

PRELIMINARY DRAFT

TABLE III

SOURCE OF IMPACT-MANAGEMENT FACILITIES
(CULTURAL RESOURCES)

Allotment	Total Number Known Sites	Total Number Sites Impacted	Source of Impact						
			Fence	Spring	Cattle-guard	Trough	Pipeline	Roads a/	Survey & Maintenance b/	Monitor for Water Quality
Blue Eagle	5	1	1		1					
Pasture No. 1 (Central)										
Pasture No. 2 (Trap)	1									
Pasture No. 3 (Oil)	1	1	1		1					
Pasture Winter No. 1										
Pasture Winter No. 2	3									
Butterfield	24	10	10	5	2	4	1			
Pasture No. 1 (Flat)	0									
Pasture No. 2 (Bench)	6	6	6	3	2	2	1			
Pasture Winter No. 1 (Mountain)	15	4	4	2		2				
Pasture Winter No. 2 (Irwin Canyon)	3									
Nyala	19	8	8	0	0	0	3			
Pasture No. 1 (Chuck Wagon)	5									
Pasture No. 2 (Goat Ranch Spring)	1	1	1				1			
Pasture No. 3 (Nyala Place)	3	1	1							
Pasture No. 4 (Crow's Nest)	10	6	6				2			
Reveille	16	1	1	0	0	0	0			
Pasture No. 1	5									
Pasture No. 2	3									
Pasture No. 3	3									
Pasture No. 4	6	1	1							
Hot Creek	71	15	10	4	0	4	5			5
Pasture No. 1 (Pritchards)	21	4	5	3		3	3			1
Pasture No. 2 (Hot Creek)	17	2	0	0		0	0			2
Pasture No. 3 (Tybo)	21	3	2	0		0	0			1
Pasture No. 4 (Sand Springs)	3	2	2	0		0	0			
Pasture No. 5 (Lunar Crater)	9	4	1	1		1	2			1
Wagon Johnnie	30	4	1	0	0	1	3			
Pasture No. 1	1		0			0	0			
Pasture No. 2	0		0			0	0			
Pasture No. 3	25	4	1			1	3			
Pasture No. 4	4		0			0	0			

PRELIMINARY DRAFT

TABLE III 9

SOURCE OF IMPACT-MANAGEMENT FACILITIES
(CULTURAL RESOURCES)

Allotment	Total Number Known Sites	Total Number Sites Impacted	Source of Impact						
			Fence	Spring	Cattle-guard	Trough	Pipeline	Roads a/	Survey & Maintenance b/	Monitor for Water Quality
Stone Cabin	30	2	1	1	0	2	2			1
Pasture No. 1	15									
Pasture No. 2	0									
Pasture No. 3	0									
Pasture No. 4	2	1				1	1 c/			1
Pasture No. 5	2	1	1	1		1	1			
Pasture No. 6	7									
Bellhelen (in pasture No. 1)	4									
Monitor (Ralston-Monitor)	5	1	1	0	0	0	0			
Pasture No. 1 (Mosquito Creek	2	1	1							
Pasture No. 2 (Combination)	0									
Pasture No. 3 (Pine Creek)	0									
Pasture No. 4 (West Mosquito)	3									
Ralston (Ralston-Monitor)	36	9	9		7					
Pasture No. 1 (Baxter Spring	6	1	1							
Pasture No. 2 (Sand Hill)	8	5	5		5					
Pasture No. 3 (Tonopah)	22	3	3							
Hunt's Canyon	6	3	2	2	0	2	2			
Pasture No. 1 (South)	3	1	1	1		1				
Pasture No. 2 (Middle)	1	1	1	1			1			
Pasture No. 3 (Hunt's)	1	1				1	1			
Pasture No. 4	1	0								
Francisco	1	0								
Pasture No. 1 (Pablo)	0									
Pasture No. 2 (Tailing Ponds)	0									
Pasture No. 3 (Big Sage)	1									
Pasture No. 4 (Winterfat)	0									
Darrough Hot Springs	2	2	2		1					
Pasture No. 1	1	1	1							
Pasture No. 2	0									
Pasture No. 3	0									
Pasture No. 4	1									

PRELIMINARY DRAFT

TABLE III-9

SOURCE OF IMPACT-MANAGEMENT FACILITIES
(CULTURAL RESOURCES)

Allotment	Total Number Known Sites	Total Number Sites Impacted	Source of Impact						Monitor for
			Fence	Spring	Cattle-guard	Trough	Pipeline	Roads a/	Survey & b/ Maintenance	Water Quality
Ione	13	5	1	0	0	1	4			
Pasture No. 1	5	3	1				2			
Pasture No. 2	1	1				1	1			
Pasture No. 3	7	1					1			
San Antone-Smoky	50	8	7	2	1	2	0			6
Pasture No. 1 (Manhatten)	5									
Pasture No. 2 (Cloverdale)	14	5	4	2	1	2				3
Pasture No. 3 (Dunes)	31	3	3							3
Willow Creek	3	2	1	1	0	0	2 c/			
Pasture No. 1 (Willow Creek)	0									
Pasture No. 2	3	2	1	1	0	0	2			
Multiple	6 d/	1	1							
Total	317	72	53	15	9	16	22			12

a/ No proposed access roads appear in proposed action. Continued use of roads currently running through sites could occur.

b/ Main impact of vandalism cannot be predicted in quantifiable terms.

c/ Site lies in Willow Creek Allotment but is potentially impacted by pipeline proposed in Stone Cabin Allotment.

d/ Exact location of Belmont-Tybo powerline poles unknown. Exact location of trails unknown.

Through MFP decision, the proposed Morey Peak Primitive Area and Six-Mile Canyon "back country use area" in the Hot Creek allotment would be closed to livestock grazing. The 13 known cultural resource sites in this area would not be impacted by the grazing system. One known site would be impacted by a proposed spring development and pipeline. In addition, the designation of this area is expected to draw increased visitor use, with a corresponding rise in vandalism of known and unknown cultural resources.

The extent to which the proposed action is known to have direct or indirect impact potential is shown in Table III-10, Summary of Impact Potential.

PRELIMINARY DRAFT

TABLE III-10
SUMMARY OF POTENTIAL IMPACT
(CULTURAL RESOURCES)

Component of proposed action	Total units proposed	Total acres of predicted impact	Total units surveyed	Number of known sites impacted	Percent of proposed action surveyed
Grazing system		4,460,548	5998.72 acres	304	0.13%
Management facilities		a/			
reservoirs	0	0	0	0	0
fences	949	1,725	0	55	0
wells	33	17	0	0	0
spring developments	37	3.7	10	15 d/	27.0
cattleguards	94	9.4	0	9	0
troughs	103	10.3	0	16	0
pipelines	157	190	0	22	0
tanks	3	0.6	0	0	0
roads	b/	b/	0	b/	0
Land treatment					
spray		3,160	0	0	0
spray and seed		36,600	0	3	0
chain and seed		2,650	0	c/	c/
Water quality monitoring	24		10	14 d/	41.7%

a/ Figure based on area impacted by construction of facility.
b/ Road construction not specified in Allotment Management Plans (AMPs).
c/ Location of area of proposed chain and seed not specified in AMP.
d/ Some spring areas have more than one site.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Summary of Cultural Resources Impacts

Proposed management facilities would result in the disturbance or loss of 72 cultural resource sites. Of these sites one is of National Register significance and two are of National Register eligibility. Proposed land treatment would disturb no known National Register properties, but could disturb three or more cultural resource sites. In addition, four National Register sites, five National Register eligible sites and 297 cultural resource sites not eligible to the National Register at this time would continue to receive impacts as the result of the effects of the grazing system. One hundred fifteen or more water-related sites would receive slight to major increase in adverse impacts. The first cycles will be the most critical for cultural resources, and the long-term impacts would depend upon the degree to which these nonrenewable resources would have been damaged in the intervening period.

The proposed action would result in regional long-term impact on scientific cultural values from the grazing systems and localized short-term and long-term impacts on cultural values from project construction and land treatment.

The loss or destruction of cultural sites would adversely affect the quality of recreation in the area. At the same time knowledge gained from salvaged sites may provide valuable scientific information.

PRELIMINARY DRAFT

Paleontology

The paleontological resources on the national resource lands of the study area would not be significantly impacted by implementation of the proposed action. Implementation of the grazing system and land treatment measures would cause no impacts.

Construction of the proposed management facilities could conceivably uncover a major fossil bone deposit. Since construction would immediately be temporarily halted to excavate the fossil, damage would be minor. (Under the 1906 Antiquities Law, construction should stop until the significance of a find is determined. A determination would then be made as to whether construction should avoid a site or whether excavation work should be done.) The scientific value of the discovery would outweigh any damages. The probability of disturbing a bone deposit, though unlikely, cannot be predicted with present data.

PRELIMINARY DRAFT

Land Use

Grazing Systems

Rest-rotation and deferred grazing systems would require livestock to be removed from national resource land (NRL) for off-periods varying from none at all on year-long allotments and up to six months on the Wagon Johnnie and Ione allotments. Seasons of use for all proposed Allotment Management Plans (AMPs) are outlined in Appendix A. Livestock would be moved from NRL: 1. to market, 2. onto another allotment, 3. to national forest lands, or 4. onto private base properties. Livestock confinement on base property during the off-period would constitute the major use of that land. It is assumed that in many instances livestock concentration and feeding on private lands would preclude other possible uses that would conflict with the livestock operation.

No significant impacts are anticipated for special public purpose, recreation, or sanitary landfill withdrawals as a result of proposed grazing systems. Proposed management facilities (fences, cattleguards, water developments) are not expected to adversely impact existing withdrawals or public purpose areas.

Facility construction may affect the locations of future public purpose grants, since their cost and physical presence would be considered in all applications or proposals.

The Railroad Valley Wildlife Management Area which is located in the Blue Eagle and Butterfield allotments is discussed in the Wildlife section of this chapter. Grazing systems would not directly affect public uses of this area, but rather, wildlife observation opportunities and hunting use would be dependent upon the response of waterfowl populations as a result of the proposal.

Urban use areas in the communities of Manhattan, Round Mountain, Ione, and Berlin would not be significantly impacted by grazing systems. Management facilities, however, could interfere with residents' activities during the construction phases, especially for proposed fences that would pass through Berlin townsite, west of Ione, around Warm Springs, and possibly at Carver's Station

Aerial herbicide spraying and reseeding is also proposed on three sides of three different parcels of private lands within the Francisco allotment, and directly adjacent to another private tract and State Route 8A immediately south of Carver's Station, a settlement of about 40 persons.

Recreation Use

Grazing systems would have long-term benefits for the overall quality of the forage resource, the setting for the outdoor recreation pursuits discussed in Chapter II. Improved plant vigor would help create a healthier and more pleasing appearance. Rested pastures would stand out in contrast to grazed pastures, and would tend to stimulate human interest in the environment and the apparent management practices.

Grazed pastures would be less desirable for dispersed activities such as sightseeing, fishing, and hunting during the use period. Conflicts with livestock use would be greatest for fishing where streambanks are heavily grazed or trampled by relatively high livestock concentrations. On the other hand, fishing, hunting, pine nut picking, wildlife observation, rockhounding, and other leisure activities would be enhanced somewhat by the absence of livestock herds.

Hunting activities would experience increases in quality commensurate with the predicted increases in game species. Hunting visitor-days would increase as a result of both grazing systems implementation and water developments together. Table III- , Changes In Big-Game Hunter Days With Proposed Action, reflects

PRELIMINARY DRAFT

TABLE III-11
CHANGES IN BIG GAME HUNTER-DAYS
RESULTING FROM PROPOSED ACTION

Allotment	Present Hunter-Days Per Year - Big Game			Total Big Game Hunter-Days/Year	Big Game Hunter-Days Per Year With Proposal By 1990			Total By 1990	Total Increase by 1990	Total Percent Increase by 1990
	Deer	Antelope	Big Horn Sheep		Deer	Antelope	Big Horn Sheep			
Blue Eagle	No data	0	0	0	0	21	10	31	31	3,100
Butterfield	355	0	0	355	620	2	19	639	284	80
Nyala	21	4	21	46	496	10	31	537	491	1,067
Reveille	126	14	0	140	310	35	0	345	205	146
Hot Creek	944	6	0	950	3,100	17	0	3,117	2,167	228
Wagon Johnnie	228	14	0	242	496	28	0	524	282	116
Stone Cabin	236	12	0	248	496	30	0	526	278	112
Ralston-Monitor	42	12	0	54	93	35	0	128	74	137
Hunts Canyon	No data	4	0	4	0	10	0	10	6	150
Francisco	10	0	0	10	25	0	0	25	15	150
Darrough Hot Springs	27	0	0	27	93	0	0	93	66	244
Ione	No data	0	0	0	0	0	0	0	0	0
San Antone	223	0	No data	223	471	0	0	471	248	111
Willow Creek	No data	0	0	0	0	0	0	0	0	0
Total Increases	2,221	66	21	2,308	6,200	188	60	6,446	4,147	180

Source: Battle Mountain District, Allotment Management Plan, 1976.

PRELIMINARY DRAFT

the anticipated growth in hunting use as stated in each AMP where hunting use estimates were available. (Bureau of Land Management, Battle Mountain District, Tonopah AMPs, 1976.) The Blue Eagle and Hunt's Canyon AMPs showed no present use figures, but predicted gains in big game populations, and subsequently, gains in hunter use.

Sightseeing opportunities for viewing cattle drives and roundups would increase, since livestock movements would occur several times every year on each allotment.

Management Facilities--Fences: Generally, recreationists on isolated rangelands do not favor fencing of undeveloped lands. One study shows that 18 percent of the users interviewed disliked man-made "improvements" in the environment.

More hunters than non-hunters voiced disapproval of "too many new roads" as the primary intrusion. The second most frequent objection was against fences. On the other hand, hunters as well as other recreationists, were found to seek out water developments to camp and/or hunt near. (Woody, "Recreational Use of Isolated Rangelands in Northwestern Nevada", 1968.)

Fences tend to guide off-road vehicle use along fence alignments wherever roads are not gated. In most cases, cattleguards or

PRELIMINARY DRAFT

gates would allow access through fences which cross unimproved roads. However, cross-country travel along fences would result in tire tracks and ruts in fragile soils.

Access routes would be maintained for administrative and maintenance purposes, allowing easier travel for recreation vehicles. Water projects are located for the most part on or near existing roads, and would not require new access road construction.

Water developments and maintained access roads would provide additional opportunities for chukar, sagegrouse and small game hunting, attract recreationists into areas that otherwise would not receive concentrated use. Conflicts would arise between livestock operations and recreation uses at some new developments. Woody ("Recreational Use", 1968), described incidences of livestock harassment, vandalism and shooting of improvements (intentional and unintentional), and littering near reservoirs, springs, and water developments on Federal grazing allotments.

Land Treatments: During herbicide spraying all proposed treatment areas would not be available for recreation uses. This would exclude 39,760 acres, or less than one percent of the study area, from available recreation lands during the spring spraying period. Since seedings would be done the following

fall, 36,600 acres would either be subject to damage from recreation vehicles, or would be closed to vehicular use for at least one year.

The spraying and seeding in the Francisco allotment would be within a few hundred feet of the Carver's Station highway roadside rest-stop and the Smoky Valley historic marker. This site is within a foreground zone for highway travellers along State Route 8A, and sightseers at the rest-stop would be directly affected by the 2,300 acre visual intrusion.

PRELIMINARY DRAFT

Livestock Grazing

Upon implementation of the proposed action, grazing use would not exceed 98,878 AUMs annually. Tables A-1 to A-4, Acres Rested and Grazed Years, 1-4, shows the reductions in active allowable use under the proposed plan both from adjudicated use to Management Framework Plan (MFP) decisions and from MFP decisions to Allotment Management Plan (AMP) allowable use. (See Appendix A.)

Reduction in allowable livestock use averages 44,013 AUMs annually (from MFP to AMP). This reduction would have social-economic implications as discussed in that section of this chapter.

While current actual use is not exactly known, quantifications were used in all tables.

Short-term proposed use would average 98,646 AUMs annually.

Assuming the objectives would be met as outlined in Table I-2, full qualifications would be restored over the long-term amounting to a total of 142,659 AUMs annually.

Two other impacts could be expected in the future. During the years immediately following implementation of the proposed systems, some reductions in livestock weight gain might be expected

PRELIMINARY DRAFT

until operations and livestock adjust to new pastures and movement schedules. Undoubtedly, the livestock would be handled more than they have been in the past. If the quality (vigor) and quantity of forage improve (in accordance with AMP objectives, Table I-2), it is possible that the "quality AUMs" would increase so that weight gains would also increase.

Higher concentrations of livestock at a time when bulls are turned out should contribute toward a better or increased calf crop.

In all likelihood the proposed fences along the highways would decrease property and cattle loss because of the reduction of motor vehicle accidents.

Livestock management as a result of the proposed action would entail moving cattle more often and, in some years, greater distance.

The proposed action would tend to stabilize the levels of grazing use in the study area as a whole. Also, the grazing animals would not be as tied to climatic fluctuations as in the case now.

The increased demand placed on private lands and hay production is impossible to quantify at this time.

PRELIMINARY DRAFT

The proposed action would allow the Bureau of Land Management is administer the land, including trespass control, in a more efficient manner.

The proposed action would increase the amount of area being grazed with better distribution patterns because of increased water facilities.

PRELIMINARY DRAFT

Agriculture

Potential croplands would be needed to produce livestock feed for use during the period when livestock would be removed from national resource lands and fed on privately-owned base properties. Improvements in the Blue Eagle, Butterfield, Nyala, Reveille, Ralston-Monitor, Hunt's Canyon, and Willow Creek allotments may determine locations of potential future agricultural land disposals.

PRELIMINARY DRAFT

Mineral Resources

No noticeable impacts on mineral resources would occur if the proposed action were implemented. The mineral areas currently (1976) in production within the study area involve relatively small acreages, usually on the steeper slopes of the mountain ranges. It is assumed that even with increased mineral production in metals, saleable mineral materials, oil (the Eagle Springs Oil Field), or with geothermal development, no measurable impacts would result from the proposed action. Any areas used for future mineral production would be exceedingly small when compared to the grazing area. Future mineral actions would contain mitigating stipulations to protect mineral and other resources.

Although the construction and physical presence of range improvement projects would not noticeably impact mineral resources, fences built for grazing systems could have a minor impact on mining activity by inhibiting vehicular traffic. However, each fence would have a gate at every major road, at all 90^{o} fence corners, and at a maximum interval of one mile.

PRELIMINARY DRAFT

Woodland Products

The 2,650-acre chaining in the Willow Creek allotment would remove between 43 and 94 percent of the pinyon pine and juniper trees. Larger trees (between 15 and 25 feet in height) would be effectively removed, while junipers under about six feet would not be severely impacted by chaining. Only national forest lands would be chained, resulting in the loss of about one-half of one percent of the study area's 485,000 acres of pinyon-juniper woodland.

Any demand for fenceposts, firewood, pine nuts, or Christmas trees which would have been met within the proposed chaining would presumably be satisfied at other locations, and would not suffer significant deficiencies.

PRELIMINARY DRAFT

Transportation Systems

Although no road construction is indicated in the proposed action, expansion of the primitive road network in the form of two-track trails is expected to evolve through use as new range facilities would be constructed and as a result of access that would be needed to the various facilities for use and maintenance purposes. Since pastures would be fenced, access to areas which were formerly unused by livestock to any extent would become a necessity for livestock management. From a transportation standpoint the development of such a trail system would be a beneficial impact.

Some proposed improvements would necessitate the need for "permanent" trails. For example, permanent waters, such as spring developments, water troughs, and wells which need to be monitored periodically for proper operation during use periods, would more likely result in trails than fences and buried pipelines. In the case of pipelines, the likelihood of permanent trails developing would be remote once the construction phase was completed.

Although increased access to more remote areas is considered to be beneficial from the transportation standpoint, a precise measurement of this benefit cannot be made unless the extent and location of the network is known or planned. Based upon the

PRELIMINARY DRAFT

nature of the proposed improvements and need for permanent trails to each, however, it can be estimated that miles of new vehicular trails would evolve.

Increased activities associated with moving livestock from pasture to pasture, maintaining and moving salt licks, and other system support measures would cause increased road use, deterioration and maintenance needs on Bureau of Land Management, county, and private roads.

PRELIMINARY DRAFT

Utility Systems

Survey and construction of major electrical transmission lines and underground pipelines could conflict with grazing systems either by disturbing livestock or interfering with operations in grazed pastures, or by disrupting rested pastures. Problems would arise from the risk of gates being left open (or closed) by workmen and possible competition for space needed for construction purposes in grazed pastures.

Fences would not seriously hamper utility system construction, since sections could easily be crossed and replaced after projects are in place. Some conflicts could occur if barriers to rested pastures are temporarily removed during construction operations. Water developments would be considered in utility corridor alignments, and would, in some cases, help determine final placement of transmission or gas pipelines.

No significant impacts are anticipated for utility systems as a result of land treatments.

Social-Economics

Population

There would be no substantial direct effect on population in the Tonopah study area with implementation of the proposed action. Population should continue to fluctuate with mining and Federal-military activity (see Chapter II, Social-Economics, Population).

The ranching community could change in composition, e.g., some ranch operator-owners could become ranch managers, but only a small appreciable increase in ranch community members should occur. These would include the additional hired help ranchers would need for cattle movements and maintenance of improvements on national resource lands (NRL).

Employment

Employment characteristics for the Tonopah study area have shown a small level of dependence on agriculture for employment (see

Chapter II, Social-Economics). This trend should continue even though the proposal calls for considerable money to be spent on improving existing rangeland conditions (see Table III-12, Implementation Costs). The Tonopah study area's principal employment potential is in services, mining, and government. No significant impacts can be expected from the proposed action.

The ranching community as well as Bureau of Land Management (BLM) District personnel could be expected to carry out much of the work the proposal calls for. Additional seasonal help may be necessary on ranches for cattle movements and maintenance of many of the proposed improvements. This could add from 35 to 45 man-months of seasonal and/or permanent employment to these ranching operations per year. Also an estimated three BLM personnel, located in the Tonopah area office, might be necessary for supervisory work.

Construction Employment: The improvements to be constructed would be done through a time schedule lasting from one to eight years in duration. Approximately 450 man-months would be required to construct all of the improvements called for in the proposal. Nearly 40 percent of the required man-months needed would be spent in fence construction. Man-month requirements by year of implementation break down as follows:

TABLE III-12
IMPLEMENTATION PERIOD COST BY ALLOTMENT BY YEAR
TONOPAH GRAZING MANAGEMENT PLAN

PRELIMINARY DRAFT

Allotment	Years of Implementation 1 (Dollars)	2 (Dollars)	3 (Dollars)	4 (Dollars)	5 (Dollars)	6 (Dollars)	7 (Dollars)	8 (Dollars)	Total	Remarks
Blue Eagle		103,050	37,300						140,350	
Butterfield			12,850			140,700			153,550	
Nyala						181,450			181,450	
Reveille		109,700	245,000						354,700	
Hot Creek	189,900	115,000	140,500					215,000	660,400	
Wagon Johnnie									97,450	-- To be implemented in year one or under existing allotment management plan.
Stone Cabin	108,600		191,900					213,000	513,500	
Ralston-Monitor			266,400		274,650			107,600	648,650	
Hunts Canyon		109,600						90,200	199,800	
Francisco						65,400		44,700	110,100	
Darrough Hot Springs					51,150		62,500	15,800	129,450	
Ione							380,500	40,800	421,300	
San Antone-Smoky			70,800	412,800			23,400		507,000	
Willow Creek									58,650	-- To be implemented in year one or two under existing allotment management plan.
TOTAL	298,500	437,350	964,750	412,800	325,800	387,550	466,400	727,100	4,020,250	

PRELIMINARY DRAFT

CONSTRUCTION MAN-MONTH REQUIREMENTS (APPROXIMATIONS)

Year of Implementation	Man-Month Requirements
1	17
2	37
3	99
4	33
5	26
6	27
7	40
8	140-240
Total	419-519

Generally the work force would originate outside the region and should have little, if any, impact on local labor. The 1976 unemployment rate is 4.4 percent (from a labor force of 2,017) for Nye County (Nevada Employment Security Department, Nevada Affirmative Action, 1976). This is a comparatively low level compared to the State average (8.8 percent from a labor force of 290,087) and the major population centers. For example, Washoe County's unemployment rate is 7.0 percent from a labor force of 79,710; Clark county is 9.9 percent from a labor force of 155,123. Statistics indicate that it would be easier to draw construction-type workers from outside the Tonopah study area rather than from within.

PRELIMINARY DRAFT

Construction employment would be considered a short-term impact. Once the construction work is finished the work force should depart the area returning to the more populated areas of Nevada.

Implementation Costs

If the proposal were implemented the BLM would spend nearly 4.2 million dollars on materials and construction throughout the Tonopah study area over the eight year implementation period (see Table III-12, Implementation Period Costs). This includes some fencing that parallel roadways that have a dual purpose of public safety and grazing management. In year three of implementation these fences, with cooperative help from the Nevada State Highway Department, would be completed.

Income

Grazing Income: The specific purpose of the proposal is to improve the range land conditions, particularly the vegetation. The results should be reflected in the allowance of additional Animal Unit Months (AUMs) of forage after implementation. This should, in turn, result in increased herd size generating additional revenues to individual ranch operations.

Herd size in the study area would increase by 5,587 head upon the fifteenth year after the proposal is initiated (based on a ten-month grazing season on NRL). (See Appendix Table, Number of AUMs By Allotment). This would include 279 bulls for breeding purposes. A normal calf crop from the remaining 5,308 cows would add 3,862 calves each year to be marketed as weaners. (A weaner is a young calf which obtains sustenance from the mother cow. Weaning age is

PRELIMINARY DRAFT

considered to be approximately six months from birth. Weaners are generally marketed after this period. The BLM considers young calves beyond this age period mature enough to actively graze on NRL, therefore needing a permit to do so). The ranching community could be expected to increase revenues by approximately $500,000 per year on the fifteenth year of proposal implementation. (see Appendix L, Table, Estimation of Ranch Revenues for calculation).

Of course, herd size may fluctuate by allotment in the beginning years of implementation. The first grazing cycle (four years) may actually find decreasing herd numbers within some allotments. But, implementation is estimated to bring about herd size increases culminating in the fifteenth year as previously described.

Taking a straight-line accounting approach to herd size increases from year one to year fifteen, it could be expected to add 3,725

AUMs per year or 373 head. Ranchers could be expected to add an additional $34,000 in revenues per year to the previous years total cumulating in $500,000 per year after 15 years. (See Appendix L Table, Rancher Returns to Grazing Improvements.)

Monies received by the United States as fees for grazing domestic livestock on public lands are to be divided, with 50 percent to be credited to a separate account in the U.S. Treasury. One-half of this credited amount is authorized to be appropriated and made available for use in the district, region, or national forest from which such monies were derived (Title IV, Section 401, Federal Land Policy and Management Act of 1976; Public Law 94-579, October 21, 1976). Depending on district appropriations, the Tonopah study area should received at least 25 percent of the full grazing fees paid by those users for improvements. The appropriations are in excess of the proposed improvement funds as stated in Chapter I of this statement. This would add an indeterminant amount of income to the study area through AUM use, project employment, and other income generating schemes.

Manpower Income: The additional manpower requirements by BLM of three supervisory and research individuals would add from $20,000 to $30,000 in spendable income in the Tonopah study area. Using Statistical Reporting Service estimates of ranch employee wage rates ($472.00 month in 1974), added spendable income should be from $16,000 to $23,000 from the additional jobs created on

PRELIMINARY DRAFT

the ranches (Nevada Crop and Livestock Reporting Service, Nevada Agricultural Statistics 1974).

Income generation by construction labor will vary by year and by activity. The implementation year schedule of expenditures by allotment (see Table III-12, Implementation Costs) includes construction costs. Using a value of $800 per man-month of labor, the approximate income inducement by year of construction implementation would be as follows:

Year of Implementation	Construction Labor Income
1	$13,600
2	29,600
3-	79,200
4	26,400
5	20,800
6	21,600
7	32,000
8	112,000 -192,000
Total	$315,200-395,200

Of course, these figures are approximate since each labor activity would have a different income value. Nevertheless, the study area could be expected to generate from 10 to 20 percent of spendable income from construction. This would be for food, lodging, and other incidental expenditures.

PRELIMINARY DRAFT

Recreation-Related Income: Recreation-related income could be expected to increase by 70 percent (from $90,455.40 in 1976) through 1990 in the Tonopah study area. If the grazing proposal were instituted an additional $100.000 could be realized over the same time span (see Table III-13, Recreation Related Income). This is an increase of 67 percent from the $153,770 over the natural increase figure. Total recreation-related income could be expected to be more than $250,000 by 1990.

PRELIMINARY DRAFT

TABLE III-13
RECREATION RELATED INCOME
HUNTING AND FISHING USE PER YEAR
TONOPAH STUDY AREA a/

Use	Present (1976)	Value Potential (1990) Without Proposal	Value Potential (1990) With Proposal
Hunting:			
Deer	$81,851.40	$137,825.00	$229,400.00
Antelope	4,026.00	6,832.00	11,468.00
Elk	---	---	---
Bighorn Sheep	4,578.00	7,848.00	13,080.00
Ducks	---	*	*
Geese	---	*	---
Upland Game	---	15.00	1,002.00
Fishing	---	1,250.00	2,500.00
Total	90,455.40	153,770.00	257,450.00

* Negligible

a/ Use Day values came from United State Department of the Interior office of of policy Analysis. The breakdowns were as follows:

Hunter Day	Value
Deer	37.00
Antelope	61.00
Elk	-
Bighorn Sheep	$218.00
Ducks	6.00
Geese	12.00
Upland Game	6.00
Fisher Day	$10.00

PRELIMINARY DRAFT

Not all of the recreation-related revenues would be spent in the community (Tonopah) or the study area. Much of the money spent on hunting or fishing is done in preparation for a trip at or near the community or location where the hunter or fisherman resides.

Income Multiplier: The "income multipliers" for selected industries within the Battle Mountain BLM District (which includes the Tonopah study area) are generally not significantly different than one (see Appendix L, Table, Economic Activity Analysis). What this means is that there is not a significant income impact when a dollar is spent in the area. The stimulus for economic growth within the area is not yet present. This condition can be expected to continue until data proves otherwise.

Public Finance and Services

Article 10, Section 2, of the Nevada State statutes (1936) limits the total tax levy for all public purposes to a level not to exceed five cents on one dollar of assessed valuation. Assuming that Nye County uses the maximum allowable rate, tax revenues for the additional 5,587 animals would be $35,900. (Appendix L Table, Estimation of Tax Revenues). Using a straight-line accounting approach for herd size increases per year, an additional $2,400. in tax revenues per year can be expected. (See Appendix L Table, Tax Revenues, Yearly and Cumulative.)

PRELIMINARY DRAFT

Social Attitudes and Expectations

The proposal intends to organize and enforce grazing management plans by allotment within the study area. By doing so a degree of resistance by local ranchers would be met. It would be reflected in part by a degree of non-compliance with BLM District regulations and political rhetoric from sympathetic politicians.

The primary attitude has been and still is "hands off" to local decisions by "outside unsympathetic bureaucrats". The benefits derived from the proposed action would have to more than offset what the study area ranchers consider as reduced choice in decision-making ability. A strong feeling of independence is found in Western community life which is also present in the Tonopah study area.

Concentration in implementing a grazing management scheme has impacts to alternative uses of NRL as well. Recreationists and other non-grazing users may well find restrictions imposed on their ability to use this same area under consideration. Fence lines limit use while new and/or improved roads create access to previously inaccessible areas.

Other Pertinent Factors

Land Values: Ranch operations which use public lands for grazing

of livestock are generally characterized as having a low level of private acreage (varying from a few hundred to a few thousand acres) while using high acreage levels (ranging from tens of thousands to hundreds of thousands of acres) of public resource lands. Fees are charged for the right to graze public lands based generally on the Animal Unit Month (AUM).

The BLM uses land-base requirements for allotment rights that are transferable. That is, the allotment right on NRL that goes with a base ranching operation (private land) can be transferred when the private land changes ownership. The right to graze carries a value reflected in the selling price of the base property. These rights include such factors as: available AUM use, quality of forage, number and kinds of permanent improvements, grazing fees, and non-agricultural demand for land. (Many of the factors influencing property values cannot be quantified. See Blaine W. Bickel, "Farm Real Estate Prices: 1950-67," Monthly Review of the Federal Reserve Bank of Kansas City, April 1969).

No precise evaluation can be made on the impacts to land values BLM may have by implementing the proposal. It can, however, be expected to affect some individual ranchers more critically than others in the region.

An important point to remember is when a resource (land) has alternative uses its value tends to increase. And conversly, a

PRELIMINARY DRAFT

single purpose resource with limited access to competing users tends to be undervalued and underutilized.

AUM Trend Data: Only two years of data are immediately available on licensed use within the Tonopah study area. They show an increase in active use, a decrease in non-use, and an increasing total use. This is similar to the Battle Mountain Statistics for the entire district over the past 16 years which are complete (see Appendix L Table, AUM Licensed Use).

The decline in non-use indicates ranchers are putting more livestock on the range decreasing their non-use capacity (Illustration III-3 AUM Use). This could imply that the range is improving. (This, however, is not likely. See Chapter II, Vegetation.)

Gross receipts have increased substantially for each size of operation (small, medium, large) since 1963 (see Rogers and Helming, Characteristics of Range Cattle Industry in Nevada-Region III, 1967, and Mitchell and Garrett, Characteristics of Range Cattle Industry in Nevada, Region III, unpublished report). Price increases and additional cattle numbers are the main contributors.

Per Unit Costs: Generally the largest ranch operations by size or allowable AUMs would receive the greatest amount spent on

PRELIMINARY DRAFT

Illustration

III- 3

Battle Mountain

AUM Use

Graph

PRELIMINARY DRAFT

improvements (e.g. the Hot Creek Allotment). On a per unit basis (AUM, Acreage), the least amount spent goes to the largest operations (by size; acreage or AUMs) (See Table III-14 , Cost Per AUM and Per Acre). Conversely, the BLM proposes to spend more per unit for smaller operations than the larger ones, (e.g. the Darrough Hot Springs Allotment).

PRELIMINARY DRAFT

TABLE III-14
COST PER AUM AND PER ACRE BY ALLOTMENT
TONOPAH STUDY AREA

Allotment	Total Cost	Cost/ AUM*	Cost/ Acre
Blue Eagle	140,350	81.50	3.15
Butterfield	153,550	57.51	1.20
Nyala	181,450	11.23	.56
Reveille	354,700	16.28	.57
Hot Creek	660,400	23,92	1.16
Wagon Johnnie	97,450	17.91	.91
Stone Cabin	513,500	33.69	1.35
Ralston-Monitor	648,650	34.95	1.33
Hunts Canyon	199,800	51.36	1.88
Francisco	110,100	84.76	6.47
Darrough Hot Springs	129,450	112.57	8.90
Ione	421,300	36.22	2.22
San Antone-Smoky	507,000	17.62	.49
Willow Creek	58,650	44.40	4.74

* The AUM count by allotment used was for the proposal objective year 15.

PRELIMINARY DRAFT

Summary Impacts

Employment: The ranching community within the Tonopah study area would need an additional 35 to 45 man-months of labor per year for cattle movements and maintenance of the proposed improvements. Three additional BLM employees would be necessary for supervisory and research work within the study area. Approximately 450 man-months of construction labor would be needed in the eight year implementation period for fences, springs, wells, and other proposed improvements.

Implementation Costs: The BLM intends to spend nearly 4.2 million dollars on materials and construction throughout the Tonopah study area over the 15 year planning period. These monies would be spent in the first eight years of implementing the proposal. The economic impacts would primarily fall on the ranch operations affecting their managerial capabilities in both the short-run and long run. The returns to such an investment would only show in the long run. Alternative kinds of uses on NRL (primarily wildlife and recreation) would benefit from the improvements being constructed.

Income: The increase in herd size through implementation of the proposal may increase rancher gross incomes by $34,000 per year culminating in over $500,000 by the fifteenth year of implementation.

PRELIMINARY DRAFT

The income from wages and salaries of new BLM personnel directly associated with the proposal would be from $20,000 to $30,000 per year. Ranch employee wages could add an additional $16,000 to $23,000 per year.

Income from construction labor should contribute from $300,000 to $400,000 in the eight year implementation schedule. The Tonopah study area should retain between 10 and 20 percent of the total construction income contibution.

An additional $100,000 in recreation-related income could be expected through the proposed action beyond the $150,000 expected by 1990 without implementing the proposal.

Public Finance and Services: Tax revenues would increase by approximately $2,400 per year once the proposal was initiated. Nye County could expect an additional $35,900 in tax revenues by the fifteenth year of implementation.

PRELIMINARY DRAFT

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CHAPTER IV

MITIGATING MEASURES NOT INCLUDED IN THE PROPOSED ACTION

This chapter identifies and describes those measures which are not part of the proposed action (Chapter I), but which would be committed (required if the proposed action is approved) by the Bureau of Land Management (BLM) to reduce conflicts or avoid some or all of the adverse environmental impacts resulting from the proposed action. Each measure is specific, real (considered feasible under existing technology), enforceable, and related to an adverse impact identified in Chapter III, but one that would not change the proposed action.

For this chapter mitigating measures are structured according to the components which collectively comprise the intensive management proposal (Allotment Management Plans or AMPs) and in numerical sequence. Following this listing a tabular summary (Tables IV-1 to IV-11) identifies the allotments impacted, the impact, the mitigating measure(s) (by number from the above listing), and the possible effectiveness in reducing the identified impact.

Monitoring and research programs would be necessary to document

changes occurring as a result of implementing the proposed action, even though these are not mitigating measures in themselves. These programs would include the studies in the proposed AMPs, and other specific resource-related studies that would address vegetation, water resources, wildlife, wild horses, visual resources, recreational resources, and cultural resources.

Adverse impacts to individual operators as a result of reductions in grazing use on national resource lands (NRL) are variable (Chapter III). They vary according to the amount of decrease and also with the degree of dependence on NRL, availability of other grazing land, and financial status.

Livestock operators would be required to maintain improvements constructed by BLM to implement the AMPs. Additional labor may also be required for some operators to move livestock from one pasture to another.

The BLM cannot mitigate adverse economic impacts occurring to individual operators utilizing the Federal range. The BLM's charge is limited to ministerial actions dealing with grazing management practices and improvements which would result in improved rangeland conditions for the benefit of all related values.

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GRAZING SYSTEMS

1. Mesic vegetation (vegetation requiring a small amount of moisture) at springs, seeps, wet meadows, and streams would be fenced. Grazing in the exclosures would be carefully timed and managed to benefit wildlife habitat. Each exclosure would be from two to 10 acres, and would require about 250-300 miles of fence to protect approximately 1,000 acres.

2. Critical threatened or endangered plant location would be fenced.

3. Additional Animal Unit Months (AUMs) resulting from forage increases would be allocated to wildlife to meet the deficiency for mule deer of approximately 3,000 AUMs and approximately 46 AUMs for antelope. After AUM demands for reasonable numbers of deer and antelope are satisfied, subsequent increases in production would be apportioned between livestock and wildlife.

4. The Kawich Range in the southern portion of Reveille and Stone Cabin allotments would be fenced off, if, after removal of the existing wild horses, other horse herds begin to expand their range into the Kawich.

5. Little Fish Lake in the Wagon Johnnie allotment would be

fenced to prevent livestock access to all of the shoreline except as provided by limited pasture water gaps.

6. Barley Creek in the Hunt's Canyon allotment would be fenced to provide livestock crossings, but would be excluded from grazing.

7. The proposed Darrough Hot Springs fence on the west side of State Route 8-A would be eliminated, and livestock would not be grazed in pasture four, Francisco allotment.

8. The east side of State Route 8-A would be fenced to exclude livestock from the North Twin River streambank.

9. Echo Canyon Reservoir, Reveille allotment, would be fenced and water piped outside the exclosure for livestock use.

10. Historical sites and other cultural resources would be fenced to preserve the integrity of designated buffer zones as specified by the Step 3 Management Framework Plan (MFP) decisions. Fences would be removed far enough from protected sites to preserve their visual integrity, would be built of compatible materials, and would blend with the natural environment in order to retain optimum historical values.

PRELIMINARY
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11. Cultural resources sites located at springs would be fenced.

12. Cultural resources sites within existing seedings would be fenced.

13. Highly significant cultural resources sites whose physical integrity may be highly impacted would be excavated.

14. Cultural resources would be maintained in their present physical state in accordance with the Bureau of Land Management (BLM) Instruction Memorandum NSO 76-120, Cultural Resources Evaluation System (CRES) until necessary evaluative data can be acquired.

PRELIMINARY DRAFT

MANAGEMENT FACILITIES

15. Construction influence zones, service roads, and compacted livestock concentration areas at water sources and loading corrals would be sheltered or stabilized by watering to minimize wind erosion and dust.

16. Water bars would be designed to divert drainage water back into natural drainage ways.

17. Design of future reservoirs and pits would allow for in-

creases in drainage area and storage capacity of structures.

19. Water would be retained at the original source at 33 spring developments in sufficient quantity to sustain wet meadow vegetation. Float valves or other devices at springs would allow excess water to overflow at the troughs.

20. Fences would be located far enough from aquatic habitat (streams, springs, etc.) to provide suitable buffer strips of riparian vegetation.

21. All project construction areas would be investigated and "cleared" by an individual with sufficient expertise to recognize threatened or endangered plant species. This would also apply to temporary or permanent access routes necessary to implement the proposed action.

22. Access routes and management facilities would be realigned or relocated to avoid critical threatened or endangered plant locations.

23. Troughs would be located at least one-half mile from browse

PRELIMINARY
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PRELIMINARY
DRAFT

PRELIMINARY DRAFT

stands or wildlife concentration areas.

24. Each fence would be marked for the first six months after construction by hanging engineer's flagging on two wires between each post.

25. In horse use areas, fences would be constructed with barbless wire.

26. In suitable areas, construction of fences would consist of alternate wooden and steel posts; in rocky areas, alternate wooden posts with every third steel post.

27. Barriers would be built which would be impassable to cattle but which horses could traverse.

28. Cattleguards would not be used in horse concentration areas.

29. Federally controlled watering places for horses would be by developing unallocated water sources in strategic locations.

30. Agreements with the owners of existing private waters would be initiated to provide adequate yearlong water to wild horses.

PRELIMINARY
DRAFT

stands or wildlife concentration areas.

24. Each fence would be marked for the first six months after construction by bonding engineer's flagging on two wires between each post.

25. In horse use areas, fences would be constructed with barbless wire.

26. In suitable areas, construction of fences would consist of alternate wooden and steel posts; in rocky areas, alternate wooden posts with every third steel post.

27. Barriers would be built which would be impassable to cattle but which horses could traverse.

28. Centipedes would not be used in horse concentration areas.

29. Federally controlled watering places for horses would be by developing unallocated water sources in strategic locations.

30. Agreements with the owners of existing private waters would be initiated to provide adequate yearlong water to wild horses.

31. Substitute the water lot (fenced water source) for a trough on each side of the fence which would contain water yearlong.

32. Water would be provided for wild horses at existing or proposed wells and/or pipelines.

33. Every effort would be made to avoid "skylining" of management facilities and to screen them from viewpoints or highways by designing sitings to take advantage of natural vegetation and topography, and to use materials consistent with characteristic landscapes.

34. Closed, cylindrical water storage tanks would be installed in a horizontal position to minimize contrast with natural forms.

35. Fenced exclosures at spring developments, and all other exclosures, would be designed to minimize straight-line contrasts and unnatural edges by conforming with naturalistic shapes and openings at each site.

36. No allotment boundary fence will be built through the National Register site of Berlin pending coordination with Nevada State Department of Conservation and Natural Resources, Division of State Parks.

PRELIMINARY
DRAFT

37. No gap fence will be built through the National Register site of Mountain View pending fencing of that site (including arrastas ruins).

38. No roads which presently impact known cultural resources sites would be used or improved for construction, maintenance, or implementation of the grazing systems.

39. A cultural resource specialist or liaison officer would be present at each construction site to monitor construction and to insure that no unintentional loss or unauthorized procurement of cultural resources occurs.

40. All roads which would not have gates or cattleguards at fences would be posted at appropriate locations with informational signs to divert vehicular traffic to gated fence crossings.

41. Ladder-type fence stiles and/or gates would be provided at all exclosures constructed as part of the proposed action to allow public access where vehicles would be prohibited.

42. Final design of all phases of proposed action would consider: 1. potential agricultural entry, 2. proposed electrical transmission lines, 3. proposed natural gas pipelines, and 4. all other known or potential needs for public or private utilities'

PRELIMINARY DRAFT

PRELIMINARY DRAFT

rights-of-way.

LAND TREATMENTS

43. All land treatments would be fenced to exclude wild horses and livestock until seedlings become established, in accordance with BLM policy.

44. A buffer zone wide enough to prevent contamination of aquatic habitats would be established in all areas where seedings are treated with toxic chemical repellents.

46. Hand revegetation and reseeding methods would be used wherever possible.

47. Where aerial seed application is essential, helicopters would be used instead of fixed-wing aircraft.

48. Areas with significant densities of plants known to be poisonous to horses would not be sprayed with herbicides which make the plants palatable.

rights-of-way.

49. Land treatments would incorporate design changes as necessary to meet visual resource management (VRM) class objectives.

SOCIAL ECONOMICS

50. Mitigating the implementation costs would require alternative methods of effectuating the proposal with lower costing materials and labor. The impacts to ranchers cannot be mitigated unless the Federal government is willing to subsidize the small operators that may go out of business. This is unlikely.

PRELIMINARY
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PRELIMINARY

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PRELIMINARY DRAFT

TABLE IV-1
MITIGATION SUMMARY
AIR QUALITY

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Compacted soils and loss of vegetation in livestock driveways and concentration areas (salt, waters, fences) would be susceptible to increased wind erosion and fugitive dust emissions.	15	Sprinkler application by water truck could reduce 60 to 80 percent of the average dust emissions due to traffic and wind. No data available for windbreaks. (Environmental Protection Agency, Fugitive Dust Emissions and Control, 1973.)
2. Vehicles used in construction and management operations would cause temporary fugitive dust emissions during dry conditions.	15	Same as above

PRELIMINARY DRAFT

TABLE IV-2
MITIGATION SUMMARY
SOIL AND WATER RESOURCES

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Deterioration and/or loss of enhancement of riparian vegetation and other adopted plants along the banks of streams, springs, and wells. (Buffer strips) Site Specific: a. Barley Creek (Hunt's Canyon Allotment) b. Mosquito Creek (Ralston-Monitor Allotment) c. Pine Creek (Ralston-Monitor Allotment) d. Meadow Creek (Ralston-Monitor Allotment) e. Willow Creek (Willow Creek Allotment) f. Six Mile Creek (Hot Creek Allotment) g. Twin Springs Slough (Reveille Allotment)	1,5,6,8,9, 11,19,20, 29-32,35,47	Sediment yields from point sources would be reduced by approximately 30 percent (over the long-term) and water quality would be moderately improved.
2. Soil disturbance during construction would divert natural drainage patterns in some areas.	16	Soil scientist assistance in the selection of specific sites and designs would help mitigate the impacts on 1,037 acres occupied by management facilities.
3. Reduced runoff would result in less available water to supply stockwater ponds and pits.	17	Hydrologist's assistance in the selection of specific sites would mitigate any reduced runoff impacts and ensure adequate water storage.

PRELIMINARY DRAFT

TABLE IV-3
MITIGATION SUMMARY
VEGETATION

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Concentrations of livestock at unfenced springs, wet meadows, and riparian areas would be detrimental to mesic vegetation (specifically at Little Fish Lake and Barley Creek).	1,5,8,9,11, 19,20,29-32, 35,47	Up to over 90 percent reduction of wetland vegetation loss or about 1,000 acres would be fenced.
2. Grazing seeded areas before seedlings are established would prevent revegetation of spray treatments.	12,43	Because of a variety of variable factors, no quantifiable success ratios with or without grazing on seedings could be calculated.
3. Mesic, aquatic, and wet meadow vegetative communities would be diminished or lost wherever spring developments collect and pipe water to distant troughs.	19	Reduced impacts would depend on amount of water left; about 35 percent of vegetative type would be preserved.
4. Grazing pasture No. 4 of Hunt's Canyon allotment every year would result in loss of vegetative cover and loss of Barley Creek riparian type.	1,6,20	Fencing would allow for increase of plant vigor, density, and total production along stream bank.
5. Wild horses would compete for wildlife and livestock AUMs in the south end of the Kawich Range (Reveille and Stone Cabin allotments).	3,4	A total of 146 deer AUMs now deficient would be available with fencing.

PRELIMINARY DRAFT

TABLE IV-4
MITIGATION SUMMARY
THREATENED OR ENDANGERED PLANTS

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Expansion of livestock distribution areas and increased densities in grazed pastures could affect any threatened or endangered plant species present.	1,2,5,6,8-12, 19-22,43,44,48	Up to 100 percent
2. Threatened or endangered plant species would be lost from livestock trails along fencelines and in permanently disturbed sites.	1,2,19,21,22	Up to 100 percent
3. Removal of vegetation during facilities' construction could result in loss of threatened or endangered plants species.	2,19-22	Up to 100 percent
4. Aerial herbicide spraying would kill up to 100 percent of any threatened or endangered plant species within a spray area.	21	Up to 100 percent

PRELIMINARY DRAFT

TABLE IV-5
MITIGATION SUMMARY
WILDLIFE-TERRESTRIAL

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Forage allocations for reasonable numbers was less than estimated demand by approximately 3,000 AUMs for mule deer and 46 AUMs for antelope.	3,23	Up to 3,000 additional deer AUMs and 46 antelope AUMs.
2. Competition for vegetation west of State Route 8-A would result in a deficiency of 122 AUMs for mule deer.	7	Up to 122 additional deer AUMs.
3. Stream bank deterioration on Barley Creek in the Ralston-Monitor allotment . . due to trampling by livestock.	6	Restoration of riparian vegetation and reduction of stream bank erosion.
4. Stream bank deterioration on North Twin River in the San Antone-Smoky allotment due to unrestricted livestock grazing.	8	Restoration of riparian vegetation and reduction of stream bank erosion.

PRELIMINARY DRAFT

TABLE IV-6
MITIGATION SUMMARY
WILDLIFE-AQUATIC

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Increased turbidity of Little Fish Lake in the Wagon Johnnie allotment would result from livestock trampling.	1,5	Up to 30 percent reduction in turbidity from to . Up to 100 percent reduction in livestock-related bacterial contamination.
2. Deterioration of shoreline vegetation, bacterial contamination, and increased turbidity at Echo Canyon Reservoir in the Reveille allotment has resulting from livestock trampling.	1,9	Up to 90 percent reduction in turbidity and livestock-related pollution.
3. Water temperatures in streams or aquatic habitat would be raised to levels exceeding optimum conditions for trout (possibly to lethal levels) by removal of streamside vegetative canopy.	1,5,6,9,11, 20	Up to 100 percent of livestock-related fish habitat deterioration.

TABLE IV-7
MITIGATION SUMMARY
WILD HORSES

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Injury from running into newly constructed fences.	24-27	High c/
2. Restriction or disruption of established movement patterns, seasonal movements, and free-roaming behavior.	27	Moderate b/
3. Horses caught and injured in cattleguards.	28	High c/
4. Significant reduction in herd size from lack of available water; physiological stress from thirst and from crowding into available waters; disruption or change in normal movement and/or behavior patterns in Reveille and Ralston-Monitor allotments.	29-32	High c/
5. Closing water lots to one pasture: resultant physiological stress from thirst, crowding at other waters; injury from running through fences in Stone Cabin allotment.	24-32	High c/
6. Spraying poisonous plants with herbicides makes them more palatable to horses, but does not reduce toxicology.	48	High c/

a/ Low - Mitigation would only provide a small or slightly detectable improvement over that which is proposed. Less than 40 percent effective in reducing the impact.

b/ Moderate - Mitigation would provide an obvious beneficial improvement but would not entirely mitigate. More than 40 percent and less than 70 percent effective in reducing the impact.

c/ High - Mitigation would provide nearly complete or complete improvement. More than 70 percent effective in reducing the impact.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

TABLE IV-8
MITIGATION SUMMARY
VISUAL RESOURCES

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Management facilties (fences, wells, spring developments, water troughs, pipelines, water tanks, cattleguards, and service roads) would not conform to natural colors, lines, forms, or textures found in natural landscapes of the study area, nor meet Visual Resource Management (VRM) class objectives.	7,10,19,20, 33-37	miles of fenceline would meet VRM class objectives; 9.5 miles of fence and two miles of pipeline would be eliminated. A total of proposed management facilities would meet VRM class objectives.
2. Fences would generally change the character of traditionally open rangeland, and would depreciate aesthetic values for many recreationists. Highest potential impacts would be in the allotments.	7,10,33,35, 36,37	miles of fenceline would meet VRM class objectives.
3. Land treatments (spray, spray and seed, or chaining) would change natural vegetation over large-scale areas, resulting in form, color, line, and texture contrasts beyond VRM class objectives.	43,44,46,47, 49	acres of land treatments would meet VRM class objectives.

PRELIMINARY DRAFT

TABLE IV-9
MITIGATION SUMMARY
CULTURAL RESOURCES

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Physical alteration of cultural resource sites or materials; disturbance or loss of vertical and horizontal integrity and natural sedimentary deposition of data.	1,10,11,12, 13,14,38,39	Up to 50 to 90 percent reduction of impacts on known resources, depending on specific situations.
2. Vandalism, inadvertant loss or destruction, or unauthorized procurement of cultural resources.	1,2,5,6,10, 11,12,13,14, 38	Any cultural resources within fenced exclosure could have a reduction in impacts up to 100 percent.

PRELIMINARY DRAFT

TABLE IV-10
MITIGATION SUMMARY
RECREATION RESOURCES

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. The Berlin spring development and pipeline along the main road to Berlin in the Ione allotment would depreciate historical sightseeing values.	10,14,36,37, 39	Spring development, pipelines, and troughs would meet class III VRM objectives, and would conform with historic character type.
2. The national resource land - Forest Service boundary fence which runs through the Berlin townsite would depreciate historical sightseeing values.	10,14,36,37, 39	Same as above
3. Fences would create barriers to cross-country vehicular use, and could result in either fenceline jeep trails or cut fences. Highest potential impacts would be in the allotments.	7,40	Nine and one-half miles of fence would prevent damage from climbing and fence cutting on impacted roads.
4. Exclosure fences would act as barriers to recreationists on foot, resulting in a safety hazard, or damaged fences from climbing. (Assumed exclosures at springs, etc., would be closed to motor vehicle traffic, but not foot traffic.) Highest potential conflicts would be in the allotments.	7,41	Nine and one-half miles of fence would prevent damage from climbing and fence cutting on impacted roads.
5. Water developments would be subject to concentrated visitor use which could result in vandalism, littering, cultural resource damage, and interference with livestock operations. Highest potential for impacts would be in the allotments.	11,13,19,20, 23,34,35,38, 40,41	Some property damage, cultural resource loss, riparian vegetation damage, and concentration at springs would be avoided.

PRELIMINARY DRAFT

TABLE IV-10
(Continued)
MITIGATION SUMMARY
RECREATION RESOURCES

Impact	Mitigating Measure(s)	Reduction due to Mitigation
6. Proposed improvements could affect future agricultural land entry in Blue Eagle, Butterfield, Nyala, Reveille, Ralston-Monitor, Hunt's Canyon, and Willow Creek allotments. Approximately worth of range improvements would be built over acres determined to have agricultural potential. About acre-feet of groundwater would be needed for grazing in potential irrigation areas.	7,42	Potential conflicts between grazing and other land used would be avoided.
7. Livestock grazing along trout streams and reservoirs would cause stream bank deterioration and reduce quality of fisheries and recreation experience. Severely impacted fisheries, such as Barley Creek in the Hunt's Canyon allotment, could result in a loss of up to fishing-days per year by 1990.	1,6,20,44	Barley Creek: additional 449 angler days. Clear Creek: additional 26 angler-days. Danville Creek additional 120 angler-days.

PRELIMINARY
DRAFT

TABLE IV-11
MITIGATION SUMMARY
LIVESTOCK

Impact	Mitigating Measure(s)	Reduction due to Mitigation
1. Livestock trespass would occur on national forest lands west of State Route 8-A in the Francisco allotment.	7	Nine and one-half miles of fence and two miles of pipeline would be eliminated. Livestock trespass would not occur from pasture No. 4.

PRELIMINARY
DRAFT

MONITORING PROGRAMS

Soil and Water Resources

There is insufficient information on hydrologic regimes (see glossary) in the Tonopah study area to adequately predict impacts of grazing systems on hydrologic outputs and erosion-sedimentation responses.

With initiation of a hydrologic monitoring program grazing seasons and intensity would be correlated with stream flow, soil water, and water quality responses. Impacts of grazing system upon hydrologic regime could be quantified.

Threatened or Endangered Plants

1. In areas where threatened or endangered plants are thought to occur, an inventory would be made on a priority basis. A system of monitoring would be initiated to determine trends in populations of those species found.

2. In other areas, an inventory would be made at the earliest possible date to determine the presence of threatened or endangered plants. The impact of livestock grazing upon them would then be studied.

PRELIMINARY
DRAFT

MONITORING PROGRAMS

Soil and Water Resources

There is insufficient information on hydrologic regimes (descriptive) in the Yampa study area to adequately predict impacts of grazing systems on hydrologic outputs and grazing-management responses.

With initiation of a hydrologic monitoring program grazing systems and intensity would be correlated with stream flow, soil water, and water quality responses. Impacts of grazing system upon hydrologic regime could be quantified.

Threatened or Endangered Plants

1. In areas where threatened or endangered plants are thought to occur, an inventory would be made on a priority basis. A system of monitoring would be initiated to determine trends in populations of these species found.

2. In other areas, an inventory would be made at the earliest possible date to determine the presence of threatened or endangered plants. The impact of livestock grazing upon them would then be studied.

3. Should these or subsequent studies indicate certain threatened or endangered species require protection, limited areas would be excluded from livestock use to ensure survival of the plants.

PRELIMINARY DRAFT

Wildlife

Terrestrial

Wildlife studies would be established in each allotment to ascertain crucial areas for big game and or any other wildlife species. Studies would be designed to monitor habitat condition and trend, and to determine which grazing animals are primarily responsible for habitat conditions, so appropriate action could be undertaken. Studies would also be performed to better delineate the actual use areas of each big game species in winter, and to pinpoint any fawning, kidding, or lambing season. An effort would be made to delineate sage grouse strutting, nesting, and wintering areas. In the process of monitoring the indicated studies a concurrent effort would be made to assess habitat interactions and affects between the non-game wildlife species and on-going management.

Cultural Resources

The Cultural Resources Evaluation System (CRES) provides manage-

ment implications for each significance rating which may be given to a site. Thus, for each evaluation category, guidelines and procedures for protection of cultural resources are stated. This document is available as Instruction Memorandum NSO 76-120 at the BLM Nevada State Office, Reno. Implementation of an intensive Cultural Resources Management Plan utilizing the CRES, scheduled in the Management Framework Plan (MFP), is the first step in increasing inventory information by which these resources are identified. This inventory itself is a mitigating measure. As cultural resources are located through inventory, specific mitigating measures would be determined by the significance of the resource and the degree of predicted impact on a case-by-case basis.

A cultural resources rating of "SO" indicates that insufficient data are known to classify the resource. In these cases, the resource must be maintained in its present physical state until necessary evaluative data can be acquired. Mitigating measures would be contingent upon the significance rating of the resource once sufficient information is available for assessment. In the interim period, the mitigating measure for the proposed action would be maintenance of the property in its present physical state concurrent with procedure to gain the additional evaluative data. All National Register or National Register eligible sites would be monitored at regular intervals, at least semi-annually,

PRELIMINARY DRAFT

and would be documented in writing and with photographs. Specific mitigating measures would be developed if the BLM becomes aware of adverse impacts on these properties.

Impacts on known and unknown cultural resources from the effects of management facilties would be mitigated through cultural resources clearance procedures as stated in the proposed action (Chapter I). Clearance procedures would thus be required for all proposed range improvements, all project sites prior to new construction, all new access roads, and any proposed land treatment.

Cultural Resources clearance procedures would include either intensive (Class 3) survey on all proposed projects, extensive (Class 2) survey with an archaeologist present at all construction sites to monitor that construction. In either method, a monitor or liaison would be present to insure no unauthorized procurement of cultural resource materials.

The information gained from each of these surveys, monitoring programs, and further assessment of SO rated sites would be used to evaluate cultural resources found and assess potential impact on them. If adverse impacts are expected, mitigating measures for the protection of cultural resources would be instituted

prior to implementation of the grazing system.

Unknown cultural resources may be mitigated through the following: 1. general inventory, 2. survey of those areas where a significant increase in erosion may occur if detected by monitoring of allotment responses to their respective grazing systems, with fencing to exclude livestock and appropriate stabilization measures as necessary, 3. further literature search and on-the-ground survey of historic trails, 4. survey of areas of high probability of cultural resources, and 5. survey of pasture areas where grazing would occur during spring wet periods. Known cultural resources may be mitigated through: 1. fencing of spring sites, 2. monitoring of springs sites for information on livestock damage and subsequent mitigating measures adjusted to those results, 3. excavation of those highly significant sites whose physical integrity may be highly impacted as indicated by the district archaeologist, 4. additional evaluation of SO rated sites to determine significance so necessary protective measures may be instituted, 5. monitoring of sites in a range of areas of topographic and vegetative diversity to gather information on livestock damage under different circumstances, with subsequent mitigating measures adjusted to those results, 6. fencing of sites within present seedings which would begin to be grazed and monitoring of these sites for comparison information on the impacts of livestock grazing, 7. fencing and stabilization

PRELIMINARY DRAFT

measures for those areas specified in the MFP decisions as requiring buffer zones, and 8. monitoring of several historical sites for information on the damage caused by livestock grazing.

Wild Horses

Information gathered from monitoring studies should be used, when applicable, to modify ongoing programs and proposed projects to further mitigate adverse impacts of these actions.

The program for wild horses should be carried out, whenever possible, in conjunction with other resource studies or field work. The Tonopah Management Framework Plan directs several studies to be initiated for wild horses (WH 8.1, 8.2, 8.3). These studies, with the addition of those listed below, would provide a comprehensive monitoring program within the Bureau's area of responsibility for wild horses. The BLM would:

1. Conduct utilization studies in rested and in fall-winter use pastures to determine the impact of wild horses grazing in these areas.

2. Monitor behavior and movement patterns of wild horses in response to newly constructed fences to note any significant deliterious effects on life history or habitat needs.

3. Check gap fences and open-ended fences periodically throughout the year to learn whether horses are indeed going around these fences and to learn what effect they have on day-to-day and random movements.

4. Monitor the movement of horses through gates between unused pastures to learn if leaving gates open is effective in providing for the free-roaming nature of these animals.

PRELIMINARY
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PRELIMINARY DRAFT

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PRELIMINARY DRAFT

CHAPTER V

ADVERSE IMPACTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

This chapter presents an analysis of the unavoidable adverse impacts that would result from implementation of the proposed action. These impacts are those residual impacts occurring after application of the mitigating measures described in Chapter IV.

PRELIMINARY
DRAFT

AIR QUALITY

Short-Term Impacts

Insignificant amounts of carbon monoxide, sulfur and nitrogen oxides, hydrocarbons, and particulate matter from exhaust emissions of equipment during construction of the facilitating measures would be added to the air.

The addition of dust particulate matter to the atmosphere from livestock movement and equipment used during construction and maintenance of the facilitating measures would be unavoidable.

Small amounts of 2,4-D herbicide could drift onto private lands and over State Route 8-A in the Francisco allotment during aerial spraying. Particulate matter from spraying would be added to the air in the immediate area of spray projects. These impacts would be localized and short-term.

Rangeland drill operations in dry soils would result in small amounts of fugitive dust during seedings operations.

Long-Term Impacts

Risk of wildfire damage and the addition of smoke would increase as a result of increased vegetative vigor and the build-up of fuel material.

SOIL AND WATER RESOURCES

In the grazing area, a total of 1,037 acres would be used for project locations rather than vegetative production.

Potential sediment yield would continue on a limited basis as a result of project construction. The potential increase in sediment yield (long-term from 1,037 acres, short-term from 1,956 acres) would be minor because of the scattered locations of proposed projects. The stipulations contained in construction criteria would minimize soil disturbances. The area which would be used for projects is small when compared to the total acreage of the grazing area. The impacts which would result from project construction are insignificant.

Some short-term soil losses would also occur from wind erosion because of soil disturbance caused by project construction.

Soil compaction in areas of animal concentrations would cause reduced water infiltration of soil. There would be a slight short-term reduction of ground cover along with a slight, short-term increase in sediment yield.

PRELIMINARY
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PRELIMINARY
DRAFT

VEGETATION

Individual pastures grazed during spring and summer would show a short-term decrease in plant vigor and litter, especially in the first year of implementation and on those allotments which would have wild horses grazing on them. Wild horses would have an effect on the speed of recovery expected from the grazing management systems. This impact is impossible to quantify, but studies associated with each Allotment Management Plan (AMP) would be able to approximate this difference.

A good allotment to observe trend and make approximations would be Reveille Allotment which would have wild horses only in pasture No. 1.

Utilization patterns would change because of pasture boundaries and increased water developments and distribution. There would be some localized loss of desirable forage species around water locations. This loss would be unavoidable, but not irreversible, if one considers that troughs could be moved.

Temporary loss from production of 1,956 acres of terrestrial vegetation would be expected because of construction of proposed range improvements. Unavoidable, permanent removal of vegetation would occur from the following proposed projects: 1. fences, 920 acres; 2. wells, 6.6 acres; 3. springs, 1.7 acres; 4. troughs, 8.24 acres; 5. tanks, .6 acres; and 6. cattleguards, 4.7 acres. The total area affected would be approximately 1,037 acres.

The following general impacts would be unavoidable with implementation of the proposed action:

Big Game

Mule Deer

There would continue to be competition for browse and early spring green-up grasses between deer and cattle on any deer winter range subjected to fall and spring grazing. Competition, although reduced below existing levels, as a result of forage allocation and sequential exclusion of livestock from large areas, would continue between cattle and deer in portions of the following allotments: Wagon Johnnie, Hot Creek, Reveille, Nyala, Butterfield, and San Antone-Smoky.

The impacts of competition for forage on mule deer could be: 1. possible loss of fetuses or fawns by does unable to find early green-up forage or quality browse in sufficient quantity to meet body requirements, 2. general decline in health in adult deer, with resultant mortality.

The late summer and/or fall grazing by cattle as proposed could result in heavy utilization of browse prior to the time mule deer would move into the area. The late fall grazing of deer use areas every year as in the proposed Blue Eagle and Hot Creek allotments could result in a general decline in vigor of shrubs. Long-term diminishment of shrubs in favor of increased

grass density could cause the following adverse impacts on deer: 1. some mortality of adult deer from malnutrition, and 2. reduced fawn production from does subsisting on inadequate diets during the high stress period of winter months. These impacts would be most severe following the late summer and fall grazing sequence and during the first two grazing cycles, (or until grass forage became sufficient to reduce some cattle use in late summer and fall).

Bighorn Sheep

Despite forage allocations, sequential exclusion of livestock from rested pastures, and reduced livestock numbers, competition between cattle and bighorn sheep would continue under the proposed action. The late summer-fall use of the primary bighorn sheep use areas as proposed under the Nyala, San Antone-Smoky, Blue Eagle, and Butterfield allotments would reduce the availability of quality browse and grasses prior to the time bighorn sheep would move onto winter areas. While competition would be lessened by a tendency for bighorn sheep and cattle to use dissimilar areas, the increased density of cattle could force use of steeper slopes resulting in continuing competition. Impacts of the identified competition could result in malnutrition and/or mortality of young or weak animals in severe winter, and secondly, reduced productivity and poorer lambs born the following spring.

Pronghorn Antelope

The early spring and fall winter grazing of one-half to two-thirds of the primary antelope use areas as proposed in the Butterfield, Nyala, Hunt's

PRELIMINARY DRAFT

Canyon, Reveille, Hot Creek, Wagon Johnnie, Stone Cabin and Ralston-Monitor allotments would result in continuing competition for water, forage, and living space. The livestock grazing of antelope use areas would reduce the overall abundance of grasses and forbs available to antelope in grazed pastures. Greatest conflict would occur in spring use areas where combined livestock and antelope preference for early green-up grasses and forbs would occur at a time when antelope would be restricted to kidding areas and unable to move to adjacent unused pastures. This competition would have the following impacts on antelope: 1. reduced forage quality and availability for nursing does and kids following weaning, resulting in possible kid mortality and, 2. possible malnutrition and decline in health of nursing does. If the vegetation responds to the proposed management as predicted, and management objectives are attained, the level of competition would diminish with each succeeding year until impact on range in good condition would be negligible.

The 949 miles of proposed fencing would adversely impact big game populations, despite construction mitigation, through hindrance of movement and possible mortality incurred in attempted passage. Death losses from entrapment or possible cuts resulting from the barbed wire would be unknown, but are not expected to exceed 10 animals per year. The impact on seasonal movements or migrations would be unknown, although it is assumed that fence construction standards and adaptability of big game animals would mitigate the majority of impact over time. The proposed monitoring studies would presumably identify major conflict areas for subsequent modification.

Small Game and Non-Game Mammals

The trampling of rodent dens and reduction of cover and food availability during and following spring and summer grazing periods would periodically reduce small mammal abundance by an estimated 25 percent in grassland types and 10 percent in shrub-forest areas.

The development of proposed tanks, troughs, pipelines, fences, and related facilities would adversely impact small mammal habitat through a short-term loss of vegetation on a total of 1,956 acres during construction and permanent disturbance of an estimated 1,037 acres occupied by tanks, troughs, fences, etc. There would also be reduction of vegetation and cover in the immediate area.

PRELIMINARY DRAFT

Birds

Upland Game

Whenever cattle are concentrated in a pasture from May to late July, there would be adverse impact on sage grouse, chukar, and quail. The eggs of these ground nesting species would not have hatched yet and there would be an undetermined amount of nest trampling and/or nest abandonment. Nests are sometimes destroyed outright; at other times, disturbance by livestock can cause nest abandonment.

In addition, predation on young and eggs increases as protective vegetative cover decreases. Removal of leaves or stems from shrubs and herbaceous vegetation makes nests of these species easier for both ground and aerial

PRELIMINARY DRAFT

predators to see and raid.

Non-Game Birds

The concentrated grazing of proposed action would alter vegetation relative to reduced food and cover, in addition to adversely affecting the productivity of ground nesting birds through exposing or trampling of nests. Confinement of grazing to some pastures and exclusion from others would sharpen differences seasonally between adjacent plant communities, creating a local mosaic of avian communities differing in species composition and density.

Construction of livestock watering troughs and storage tanks invites birds and small mammals to attempt to drink. Even with bird ladders (ramps) installed, a few animals and birds would fall in and drown, contributing to mortality rates of wildlife that would not have occurred without the troughs.

Vegetative Conversion

The proposed conversion of 39,760 acres of sagebrush, and 2,650 acres of pinyon-juniper, sagebrush types to primarily grasses through use of herbicides and chaining would affect the complete spectrum of wildlife utilizing these sites and adjacent habitats.

The wildlife species closely associated with sagebrush habitat, such as sage sparrows, Brewer's sparrows, sage grouse, sagebrush lizards, sagebrush voles, etc., would be eliminated or greatly reduced in the proposed treatment areas. These species are dependent upon the sagebrush type for food and cover, consequently any reduction in total acreage could reduce population levels.

predators to see and raid.

Non-Game Birds

The concentrated grazing of proposed action would alter vegetation relative to reduced food and cover, in addition to adversely affecting the productivity of ground nesting birds through exposing or trampling of nests. Confinement of grazing to some pastures and exclusion from others would sharpen differences seasonally between adjacent plant communities, creating a local mosaic of avian communities differing in species composition and density.

Construction of livestock watering troughs and storage tanks (water birds and small mammals to attempt to drink. Even with bird ladders (ramps) installed, a few animals and birds would fall in and drown, contributing to mortality rates of wildlife that would not have occurred without the troughs.

Vegetative Conversion

The proposed conversion of 10,700 acres of sagebrush, and 3,650 acres of pinyon-juniper, sagebrush type to potential grasses through use of herbicides and chaining would affect the complete spectrum of wildlife utilizing these sites and adjacent habitats.

The wildlife species closely associated with sagebrush habitat, such as sage sparrows, Brewer's sparrows, sage grouse, sagebrush lizards, sagebrush voles, etc., would be eliminated or greatly reduced in the proposed treatment areas. These species are dependent upon the sagebrush type for food and cover. Consequently any reduction in total acreage could reduce population levels.

PRELIMINARY
DRAFT

The proposed reduction of sagebrush would have an adverse effect upon the diversity of bird species dependent upon the middle and lower strata of the sagebrush type. Bird species such as the Brewer's sparrow and vesper sparrow are virtually eliminated from areas of sagebrush eradication.

Small Mammals

The reduction of cover and food sources provided by sagebrush and associated herbaceous vegetation would decrease abundance and diversity of small mammals in the treated areas.

PRELIMINARY
DRAFT

PRELIMINARY DRAFT

WILD HORSES

The bulk of unmitigated adverse impacts on wild horses would result from the proposed fences. The extent and consequences of these impacts are largely unknown because of a lack of knowledge about herd and band movement, habitat needs, and life history. Whether restriction or change of daily movement resulting from fence construction or the restriction of seasonal movement (such as in Stone Cabin Valley) would alter certain behavior -- other than movement -- or create significant physiological stress is unknown, and would be difficult to quantify if it were known. The effectiveness, to some degree, of proposed mitigating measures is unknown.

Unavoidable adverse impacts which can be specifically identified are discussed by allotment.

Reveille Allotment

Removal of wild horses from historic use areas: The impact of removal is mostly a legal question. Whether the impact would be adverse would depend upon intrepretation of the Wild Horse and Burro Act. It could be assumed that if removal under the existing circumstances is interpreted as contrary to the Act, the impact would be adverse. Interpretation of the Act is outside the scope and intent of this statement.

Stone Cabin and Wgaon Johnnie Allotments

Continuous and gap fences on the National Forest boundary: These fences and gaps could trap individual bands of horses at lower elevations during spring

turn out of cattle in a pasture bordering the national forest land. The gates to the forest would be closed when cattle are turned in. Where continuous fencing is proposed, this could effectively prevent drift to higher elevations. In those areas where gap fences are proposed, horses could move around the ends to get into higher country. Whether being held at lower elevations for part of the year would produce significant adverse impacts, other than simple restraint, is unknown.

Stone Cabin, Ralston-Monitor, San Antone-Smoky Allotments

Highway Fences and the Dunes-Cloverdale Fence: The highway fence proposed in the Stone Cabin allotment would effectively eliminate the seasonal movement across U.S. Highway 6. Similarly, the highway fence proposed in the Saulsbury area of the Ralston-Monitor allotment would also eliminate drift across U.S. 6. Although there is little seasonal movement across the road in this area, it would split the herd. The Dunes-Cloverdale fence proposed in the San Antone-Smoky AMP could split the Monte Cristo wild horse herd and eliminate the drift of a few bands or individuals on and off the Monte Cristo Range.

As stated earlier the specific impacts and the significance of these constraints of movement is unknown at present.

PRELIMINARY
DRAFT

PRELIMINARY DRAFT

CULTURAL RESOURCES

Continued trampling by livestock over a broad area cannot be avoided if the objectives are to be met. Erosion would be reduced, but not eliminated. Destruction or loss of paleoecological data would also occur. Vandalism because of increased access into areas and increased project activities would continue. Salvage mitigation would prevent loss of data and cultural material; however, salvage results in permanent removal of that data from its context and destroys its potential for contribution in future methodology and research projects. Damage to unknown sites and subsurface sites not discovered during project surveillance could occur. Emergency salvage, if required by unexpected discoveries during project implementation, would not be highly effective. Damage and destruction would be expected to occur at known cultural sites, even with full implementation of the mitigating measures, until full implementation of a cultural resources management plan.

These unavoidable adverse impacts would constitute deterioration or loss of non-renewable resources and irreplaceable removal of cultural data base.

VISUAL RESOURCES

Contrasts in plant form, line, color, and texture would occur between pastures, and would create an unnatural appearance along pasture and allotment boundaries, as a result of intensive grazing and yearlong rest occurring in adjacent pastures. The visible contrasts would continue over the long-term, even though overall range plant vigor and abundance would improve.

Livestock trails, and in some cases vehicular trails, would develop along fencelines. These would cause noticeable contrasts where vegetation is removed and soils are compacted.

Even with careful siting, screening, and harmonious coloration, fences would remain as unnatural intrusive structures in most foreground view zones. Highway fences or those along other travel routes would not meet visual resource management (VRM) class objectives because of their highly visible color and close proximity to viewpoints.

Windmills, water troughs, storage tanks, pumpjacks, and above-ground pipelines would be visible intrusions in many areas where they would not be screened from viewpoints or blended into existing landscapes. The highest impacts from water developments would be in the allotments.

Cattleguards would continue to cause color and form contrasts, and visual intrusions, and would not meet VRM class objectives in any proposed location.

Aerial sagebrush spraying would not meet VRM class objectives in the short-term. Over the long-term, contrasts would become less noticeable, if mitigating measures for designs are successful. Spray and reseeding operations would revegetate to a near-natural grassland plant community appearance over the long-term.

PRELIMINARY
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PRELIMINARY DRAFT

Recreation Resources

Recreationists would interfere with livestock operations whenever intensively grazed pastures conflict with primary recreation resource areas used for sightseeing, hunting, pine nut gathering, fishing, and wildlife observation. Mitigating measures were proposed to alleviate the potential problems caused by livestock upon recreation activities, such as fencing corridors to eliminate grazing along streambanks. Recreation-livestock grazing conflicts would continue in isolated pastures in spite of exclusions from specific areas as outlined in Chapter IV. Those allotments most affected would be pastures containing known sightseeing values, game populations, and other attractions, or those which contain open water and good vehicle access and are intensively grazed during the recreation use season.

Sightseeing values would be diminished somewhat whenever management facilities or land treatments intrude on national landscapes. Even if projects are made less visible, their presence would change the character of recreation settings where none existed before construction.

Agriculture, Mineral Resources, Woodland Products, Transportation, Utilities

If mitigating measures from Chapter IV are implemented, no significant impacts would occur for agriculture, mining operations, forest-woodland products, or utility systems. Increased road maintenance would be required for county, BLM, private, and possibly State roads. Construction crews and equipment would cause slight inconveniences to motorists on a few roads during construction

operations; however, these impacts are anticipated to be relatively minor, and would occur only in isolated instances.

Livestock Grazing

Reduced grazing on most allotments would be an adverse impact. This loss of Animal Unit Months (AUMs) would be unavoidable even if at the end of 15 years the AUMs are restored in accordance with Allotment Management Plan objectives. The amount of AUMs lost would amount to an average of 44,013 AUMs (31 percent not used) yearly for at least the first four years and would decrease slightly until reaching full use again as determined by studies. Generally the AUMs are expected to be at or slightly below adjudicated limits.

PRELIMINARY DRAFT

SOCIAL ECONOMICS

The construction of improvements needed to implement the proposed AMPs would be by contract and would be accomplished over an eight-year period. Construction would require about 450 man-months of labor to be supplied primarily by a non-local contract construction work force. Additional labor required for maintenance of improvements, once constructed, would be accomplished or supplied by livestock operations in the Tonopah study area. These impacts are considered unavoidable.

Several mitigating measures discussed in Chapter IV would involve improvements and costs not discussed or considered in the discussion of impacts (Chapter

III). The mitigating measures include additional fencing and troughs, along with changing or deleting AUMs and conducting studies and surveys.

It is most difficult to quantify the mitigating measures at this time. However, it is important to point out that an economic cost would be incurred in most instances where mitigation takes place.

An important condition would exist once the commitment of resources were made. It can best be explained through the question of who pays the costs of implementation and who benefits from implementation? The majority of funds would come from Federal taxes of which Tonopah area residents contribute a small proportion. The benefits, on the other hand, are derived primarily by dependent ranchers and others in the Tonopah area. (This analysis is taken from a study done by Joe B. Stevens and E. Bruce Godfrey, An Economic Analysis of Public Range Investments on the Vale Project, 1960-1969. The application is parallel since many of the proposed projects for the Tonopah area are similar to those instituted in the Vale project).

These are unavoidable adverse impacts in a public sense. Secondary or tertiary side benefits (public derived) from the proposed action would be small in comparison.

The imposition of more restrictive management practices by a governmental agency would conflict with local and self-deterministic values, thus generating an adverse impact on those affected. The point is that these values

are attitudinal in nature. National resource lands (NRL) are not intended for single purpose use. Rather multiple, if not equal, use is mandated by the public. Limiting use or accessibility for use of NRL adversely affects principal and non-principal users alike. In a social sense, there are only disgruntled users sharing the resources.

PRELIMINARY
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TONOPAH CH. VI

PRELIMINARY DRAFT

TONOPAH CH. VI

PRELIMINARY
DRAFT
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PRELIMINARY DRAFT

CHAPTER VI

THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

INTRODUCTION

This section provides a long-range view of the trade-offs involved in carrying out the proposal. The relationship between short-term commitment of resources and the long-term effect on environmental values is especially important.

For this analysis, short-term is defined as approximately 15 years, or the time required to establish the grazing systems and to complete the proposed management facilities and land treatment programs. Long-term refers to that period of time after the objectives of the proposed action have been met (see Table I-2 for specifics), but impacts of that action are still occurring.

PRELIMINARY DRAFT

It should be noted that the impacts treated in Chapter III were discussed as if the components described in the proposal would all be completed at the same time. As a practical matter, however, not all systems or projects would be implemented or constructed simultaneously. (See Table I-5, Implementation Schedule.) There would, therefore, be an interim period during which projects would be started and finished at different points in time over several years.

The assumptions given in Chapter III were also treated as being in full effect at the time implementation would start. Some of the assumptions, however, such as management Framework Plan (MFP) decisions, would take effect when implemented, across a time span of a few years. An example, is wild horse numbers. One of the "givens" for the Chapter III impact analysis was the MFP designation of 520 wild horses for the area. Presently there are in excess of 1,500 horses in the area, and several years would be required to reduce their numbers. Meanwhile, horses in excess of the prescribed level would be consuming forage that has been allocated to wildlife and livestock.

During the interim, the time of which would vary for each allotment, the Nevada Range Policy would be in effect. The impacts associated with this policy are described under alternative No. 1 in Chapter VIII.

The overall objective of the proposal is to improve the quality of the range in the study area through intensive grazing management

PRELIMINARY DRAFT

(Allotment Management Plans). This means among other things, improving the quantity and quality of vegetation, decreasing erosion, and increasing dependable water supplies. The results would include a net improvement in watershed qualities and an increase of available Animal Unit Months (AUMs) for both livestock and wildlife. In the long run, the program should achieve the major aspects of the national policy of creating and maintaining conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations.

SHORT-TERM, LONG-TERM, AND CUMULATIVE IMPACTS

As pointed out by Heady (Rangeland Management, 1975), grazing, as an ecological factor in the rangeland ecosystem, causes the major vegetative changes. (An ecosystem is the complex of a community and its environment functioning as an ecological unit in nature.) If the area is overgrazed, vegetation and soil are damaged. Grazing management practices, on the other hand, depend on the benefits of grazing. Thus, in different contexts, grazing can either deterioate or improve the ecosystem.

Implementation of the proposal is expected to result in short-term increases in wind and water erosion, as a higher density of cattle is introduced for the first time into restricted pastures.

PRELIMINARY DRAFT

Over the long-term, however, as vegetative cover increases in vigor and density, an overall decrease in erosion can be anticipated. Although a regional decrease in erosion is predicted, there are certain allotments where erosion and runoff are expected to remain the same or actually increase. These are the Nyala, Hunt's Canyon, Darrough Hot Springs, Hot Creek, and Francisco allotments.

Grazing animals are important in mineral redistribution and nutrient cycling. Since animals tend to congregate in certain areas, such as near water, salt, and shade, a disproportionate amount of minerals and other nutrients consumed elsewhere are deposited in these areas. Selectivity of feed can also add to the disproportionate distribution of these substances. Proper grazing can protect the soil resource by preventing accelerated erosion which carries away important elements. In addition, control of livestock distribution can reduce nutrient redistribution by preventing local overgrazing and concentrations of livestock (Heady, Rangeland Management, 1975). However, cattle are still expected to concentrate, although to a lesser extent, at waters and other select areas, even with increased controls (see Chapter III, Wildlife, Vegetation).

On a regional basis, water quality is expected to improve in the long-run. This would be due to both the lowered sediment yields

PRELIMINARY DRAFT

resulting from decreased soil erosion and to a reduction in livestock-related pollutants (fecal strep, phosphates, and nitrates). Specific levels of improvement or decline in localized areas in water quality are discussed in Chapter III, Water Resources. (Groundwater resources would not be affected by the proposed action.)

Short-term declines and long-term benefits in the vegetative resource are also expected to result from the proposed action. Increased stocking rates per pasture, initial construction, and land treatments would result in increased pressure on or removal of, existing vegetation. After the grazing systems have been in operation for several cycles, however, and revegetation has taken place around management facilities and land treatments, vegetative diversity, quality, vigor, and density are expected to increase. Productivity is anticipated to increase by 44,013 livestock AUMs, or 31 percent of the vegetative resource. Accompanying the increase in vegetative productivity are other benefits (some mentioned above) such as decreased overland flow, increased infiltration rates, and the resultant stabilization of, or improvement in, erosion condition class.

Trailing of livestock and the rotation of animals among a series of pastures has an effect on the dispersal of plants. Seeds ingested in one area can be carried to another pasture and deposit-

PRELIMINARY DRAFT

ed there. According to Heady (Rangeland Management, 1975), cows can retain a few types of seeds in their digestive systems for seven or more days. Many of these ingested seeds remain viable, and germinate after deposition. Heady goes on to point out that animals probably do serve to keep plant populations thoroughly mixed on a small scale (0.5 - 1 square mile). On a regional scale this relationship between plants and livestock becomes much more complex.

The expected regional increase in quantity and quality of forage would also have an overall beneficial impact on wildlife species over the long-term. The effect among individual classes of wildlife differs considerably, however.

Short-term adverse impacts would be felt by deer, antelope, and bighorn sheep because of the higher density of livestock and the overutilization of winter and spring ranges where these wildlife species occur (see Wildlife, Chapter III). Although increased carrying capacity and available forage in the long-run would result in increased populations, the levels are not expected to exceed 50 percent of the all-time high.

Land treatment programs, fencing, water developments, alteration in some spring habitats, and changes in vegetative composition from browse species toward grasses, all would have a long-term effect, both beneficial and adverse, on wildlife. For example,

PRELIMINARY DRAFT

large scale removal of sagebrush and replacement by grass species would result in the virtual elimination of certain wildlife populations for that area. On the other hand, the "edge effect" created by vegetative manipulations would have a positive impact on those species occupying the ecotone or transition zone.

Location of fences along streams, meadows, or other riparian habitat allowing concentrated livestock use could cause a significant reduction in fish populations (see Chapter III, Wildlife, Aquatic Habitat). The resulting losses of aquatic habitat could continue for the long-term. This loss could become permanent.

Overall productivity of streams in the study area would decrease slightly. Forty-three percent (11.7 miles) of the 26.9 miles of stream would improve, while 57 percent (15.2 miles) would have long-term productivity reduced by residual adverse impacts (see Wildlife, Aquatic Habitat, in Chapters III, V).

There would be long-term impacts at spring developments where all or a portion of the water would be removed from the springhead and taken by pipeline to a trough some distance away. The riparian habitat at the spring would be altered, or reduced in area even if some of the flow were retained at the springhead.

Wild horse numbers would eventually be reduced to MFP levels of 520. This reduction from present numbers estimated at 1,538 could be viewed as a tradeoff to other resource values, such as increased beef production in the long-run. In addition, the fencing to be constructed would result in a long-term restraint in the mobility of horse herds (as well as wildlife species).

Several factors impact the recreation resource.
In the long-run, opportunities to view wild horses on the open range would decline, both because of reduced numbers, and increased fencing. Increased fencing, especially along highways, would represent increased intrusions upon the natural landscape, lessening the feeling of "wide open spaces" associated with the American West. On the other hand, the long-range improvement anticipated in rangeland quality should result in a more pleasing "aspect" than is presently the case over much of the area.

Hunting and fishing values are expected to increase in the area by 1990. The potential value increase is predicted to be 67 percent (See Table III-13, Recreation Related Income).

Cultural and historic resource values would be inventoried and assessed prior to any construction activities. The information gained from these studies would be of immediate and long-term benefit to the scientific knowledge of the area. However, any salvage that becomes necessary, although contributing to the body of scientific data, would also represent a long-term loss of that site.

Land treatment programs in the short-term could also result in long-term loss of paleoecological and paleo-environmental data. Short-term effects of the grazing systems, such as increased erosion and trampling at springs, could result in deterioration and/or long-term loss to the cultural resource data base.

In the long-term, there would be continued, cumulative deterioration, and/or loss to the cultural resource data base through trampling. The long-term expected decrease in erosion would result in stabilization of cultural properties to the degree that short-term impacts have not deteriorated their condition.

Social-economic conditions would also be affected by the proposed action over the long-term. Permanent employment should increase in the short-term for both ranching and the BLM, with the increase stabilizing by the eighth year of implementation. Construction employment, on the other hand, is a short-term phenomenon, and may not affect those within the study area.

The livestock industry is an integral segment of the Tonopah study area economy. Although grazing of national resource lands (NRL) represents a small percentage of livestock industry income, it is considered important. The proposed action would stabilize and improve both the quantity and quality of livestock forage in the long-term. Income attributable to livestock grazing on NRL would initially decline from the recent past. It would then

stabilize over the short-term and probably increase in the long-term. Long-term benefits are considered to exceed short-term losses of income from the livestock industry (see Chapter III, Social-Economics).

County tax revenues would respond in similar fashion to livestock industry income. In the long-term, these tax revenues should increase.

RISKS TO HEALTH AND SAFETY

Health and safety as they relate to implementation of the proposed action are of interest in a few respects, although the effects generally cannot be quantified.

The long-term aspects of range improvement (e.g. increased forage) would result in healthier populations of most classes of animals, both domestic and wild.

Fences could represent a hazard to wild horses and some forms of wildlife until the animals become accustomed to the presence of these barriers. This risk would be of short-term duration following construction of each fence. Wild horses have, on occasion, been trapped in cattleguards, but these occurrences would be expected only under stress conditions. Such situations are not expected to be frequent (see Chapter III, Wild Horses).

Fencing along highways can have a beneficial effect on safety. Under present conditions, range cattle on highways in the study area constitute a recognized hazard. Fencing along the highways would reduce this hazard.

BLM manuals prescribe appropriate measures to be taken when applying sprays or other toxins. An inadvertent spill, or other accident which might release these chemicals, could result in a long-term effect on the environment (see Chapter III, Wildlife, Aquatic Habitat, and Chapter VII for a specific example).

ALTERATION IN QUALITY OF LIFE

Any discussion of changes in quality of life is difficult since people disagree on the definition of the term. Because of the subjective nature of the topic, certain changes brought on by the proposed action might be viewed as positive by one group and negative by another. These changes, whether viewed as beneficial or adverse, are expected to be slight (see Social-Economics, Chapter III).

The local population is expected to increase slightly. This may be perceived as an adverse effect by local residents, but increased services often accompany population increases. The rural atmosphere is expected to be retained.

In the long run, rancher income is expected to increase. Increased income has long been interpreted as an indicator of improved quality of life, but it is also recognized that there are exceptions to this view.

Another long-term result of the proposal would be increased beef production. This effect is not limited to the study area itself, but would be felt by the nation as a whole. The increased value of calf production in the study area over 15 years is predicted to be $500,000 (see Appendix L, Social-Economics). When added to long-term increases over NRL in the Western states, the increase would be substantial. The increase in beef production would probably be considered by the general public as benefiting their quality of life, although no surveys have been located to prove or disprove this claim.

PRELIMINARY DRAFT

TONOPAH CH. VII

PRELIMINARY
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TONOPAH Ch. VII

PRELIMINARY DRAFT

CHAPTER VII

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION SHOULD IT BE IMPLEMENTED

Commitment of Resources

This chapter identifies the degree to which implementation of the proposed action would irreversibly limit the potential uses of the land and natural resources. The term "irreversible" is defined as incapable of being reversed. The use would continue once it had begun. The term "irretrievable" means that once used, it is not replaceable.

Several cultural sites could be irreversibly lost within their natural settings as a result of the proposed action. Any construction of management facilities that encountered cultural resources and disturbed the land surface would cause these resources to be preserved as data only; the sites would be salvaged with the materials being removed from their surroundings. Though study of the sites would result in new cultural resource information, the sites, once excavated, would not be in existence for future study. Livestock grazing, especially near water sources where cultural sites are likely to occur, may destroy an

PRELIMINARY DRAFT

unknown number of cultural sites through increased trampling and on-site erosion (thereby destroying the arrangement of strata or layers of a site). Additional access that would develop from construction and maintenance of new management facilities would allow for increased vandalism of cultural sites. Any sites destroyed by livestock grazing or vandalism would not be salvaged, so the cultural data would be irretrievably lost.

Every livestock operator (with the exception of two) in the study area would incur an average of 25 percent reduced stocking levels. Over the short-term some operators may incur some additional expenses in hiring new employees to operate the grazing programs. This monetary loss would be short-term. Over the long-term the operators should experience a monetary gain from increased calf crops, weaning weights, and reduced livestock mortality.

The functions of an ecosystem are dependent upon the primary producers or green plants that convert solar energy directly for the synthesis of foodstuffs. The consumers (livestock) utilize the producers (plants) which are, in turn, utilized by man. The removal of livestock for the purposes of human consumption is an irretrievable loss to the ecosystem in the sense that they are no longer part of that system that would be allowedto recycle. This transfer of energy in the ecosystem is lost. However, this commitment is thought to be insignificant and immeasurable.

Any trails that develop from construction or maintenance of management facilities would commit the land to that use. While it would be possible to reclaim this land, trails generally become irreversible because of public use. Since no roads or trails are planned in the proposed action, it is impossible to quantify the number of acres that may be lost from incidental trail development.

Irreversible vegetative loss would occur as a result of the construction and physical presence of management facilities. This site-specific impact is reversible in the sense that the management facilities could later be removed, but once they have been constructed, they are likely to remain for the foreseeable future. Since the acreage disturbed during construction (1,956 acres) and the acres that are permanently occupied or impacted over the long-term(1,037 acres) are insignificant when compared to the total acreage of the study area, this vegetative loss would be considered insignificant. Any inadvertent destruction of threatened or endangered plants would result in an irretrievable loss.

Endangered or threatened species of fish are the most vulnerable aquatic animals. The entire population of some species could be severely damaged and possibly eliminated from limited aquatic environments. For example, in a drainage just north of the Tonopah area endemic forms of speckled dace have been eliminated when toxaphene, a chlorinated hydrocarbon used to dip cattle, was allowed to get into the stream.

Aquatic habitat, such as streams and meadows areas, lost because of degrading stream channels and lower water tables, is seldom restored by natural means. Losses in most fish populations are retrievable and/or reversible. However, physical changes in aquatic habitat supporting lands, would have a long-term adverse effect.

The spending of approximately $4.2 million for materials and construction of facilities and implementation of land treatment measures (includes all labor cost), $20,000 to $30,000 for Bureau of Land Management supervisory employees, and $16,000 to $23,000 private expense for new ranch employees would be an irretrievable commitment of funds. Government funds used for the proposal would be unavailable for other programs.

Additionally, there is a commitment of human capital of from 490 to 600 man-months in the first eight years of implementation. This is not irreversible, but is an irretrievable resource once allocated.

Commitments by public entities to change social behavior at a local or regional level become both irreversible and irretrievable in the forseeable future.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

TONOPAH CH. VIII

PRELIMINARY
DRAFT

CHAPTER VIII

ALTERNATIVES TO THE PROPOSED ACTION

This chapter presents alternatives to the proposed action which include:

1. Continuation of present management (No action).
2. Minimal investment to achieve basic management objectives.

The alternative to reduce the level of management (custodial management) was considered. Under this alternative the Bureau of Land Management (BLM) would function as custodians issuing required permits and maintaining all records or documents pertaining to livestock grazing on national resource land (NRL). The management of the range forage resource would be at the discretion of the livestock operator. The following criteria were used in determining whether or not an allotment was suited for custodial management: 1. Present range condition is satisfactory, 2. Present management is satisfactory, 3. Other resource values are minimal, 4. There are no significant conflicts with other resources, and 5. A small amount of NRL is involved in the allotment.

None of the 14 allotments in the Tonopah study area meet these criteria; therefore, custodial management is not analyzed.

PRELIMINARY DRAFT

"No grazing" as an action that would eliminate livestock grazing on NRL in the Tonopah study area was also considered, but deleted as an alternative to the proposed action. Through the Management Framework Plan (MFP) Step 3, grazing was eliminated from two contiguous areas (see Chapter I, Elimination of Grazing) in the Hot Creek allotment because of their potential for primitive area designation.

"No grazing" areas occur within nearly all allotments through reduced forage allocations. Reductions were made on the basis of excessive slope, water and forage availability. These areas, while lacking physical restraints from grazing, are expected to receive no use or only incidental use, since forage requirements for the reduced livestock numbers would be provided by the suitable grazing lands. The allocation of available forage is related directly to MFP decisions discussed in Chapter I (Table I-4, Allotment AUMs, and Interrelationships). This forage resource becomes the basis for determining the proposed action through the allotment management plans (AMPs) and is therefore not addressed within the context of an alternative. The objectives of the two alternatives discussed here are similar to those included in the proposed action, i.e., to maintain or improve the renewable resources of NRL through the use of livestock grazing management. The means of obtaining the objectives, however, would not be through the proposed action but rather through the alternative. Many of the impacts resulting from the proposed action would also be expected to occur with the implementation of the alternatives.

PRELIMINARY DRAFT

CONTINUATION OF PRESENT MANAGEMENT (NO ACTION)

Description

Under this alternative, the present livestock grazing practices as determined by the Nevada Range Policy, established in January 1976, would continue. This policy amplifies conformance with the Federal Range Code, developed pursuant to the Taylor Grazing Act.

The following conditions are assumed to be applicable:

1. Adjustments in the authorized stocking rates would be made, as in the proposed action, in accordance with Management Framework Plan (MFP) allocations to balance forage use with forage production. Reductions would range from 0 to 100 percent for an overall reduction in licensed use of 20 percent.

2. The two allotments of Wagon Johnnie and Willow Creek which are currently under allotment management plans or AMPs (119,672 acres NRL) would be intensively managed and maintained, while non-AMP allotments (covering 3,923,631 acres NRL) would be managed under the constraints of the Nevada Range Policy and Taylor Grazing Act which stipulate season of use, class of livestock, and stocking rates. There would be no additional AMPs developed.

3. New range improvements would be limited to those under Section Four permits, cooperative agreements, improvements constructed from range improvement funds, or range improvements as scheduled on the two implemented AMPs.

PRELIMINARY DRAFT

4. The study area would continue to be managed as in the proposed action, for timber, wildlife, minerals, recreation, and other resources.

5. Livestock would be removed from rangelands for a minimum of two months during the plants' critical growth period (4/15 to 6/15 in most allotments).

Analysis

Because the level of grazing under this alternative would not be different than the Nevada Grazing policy, impacts would be the same as noted in Chapter II, Future Environment Without the Proposal. This alternative would not be expected to affect climate, air quality, paleontology, mineral resources, or transportation networks.

Soils

Under the "no action" alternative, forage production on presently grazed areas would be expected to increase with concurrent improvements of vegetative cover as a result of reduced stocking rates and yearly exclusion of livestock during a minimum two-month period. The anticipated improvement is assumed to be less than under the proposed action, with use areas such as stream margins, etc., continuing to be over-utilized. Erosion condition classes could potentially increase throughout the area with critical erosion continuing in areas such as along Ione Wash, Willow Creek, and Barley Creek. (See the Erosion Condition Map in Chapter II.) By taking

PRELIMINARY DRAFT

into account the offsetting influences of reduced livestock numbers, improvement in vegetation, and maintenance of existing AMPs, potential losses from wind erosion would represent slightly lower values than the present situation.

Potential sediment yields would be expected to remain static overall under this alternative. Livestock trampling of stream banks with resultant increase in sediment would continue, but would probably be slightly reduced as a result of decreased numbers, and limited vegetative improvement. The increased sedimentation would be localized and immeasurable.

Water Resources

Peak runoff rates would be assumed to remain relatively unchanged under the "no action" alternative. While quantitative data are lacking it is assumed that runoff rates would decline on areas under AMPs with a slight increase expected for areas not covered by AMPs. The increase in runoff rates would result in localized impacts on stream banks, and meadow areas, where increased erosion, bank sloughing, and headcutting could be expected. The extremely limited nature of such areas in comparison to the adjacent dry land, would result in an immeasurable impact overall.

The chemical quality of surface water would probably reflect the localized increase in sediment, but not enough to effect existing

PRELIMINARY

water usage. The net affect on water quality cannot be estimated from present data.

Average annual groundwater withdrawal would approach 1,760 acre-feet by the year 1997, an increase of 1,600 acre-feet, or 10 percent over existing withdrawls. Since the quantity of available groundwater and the rate of recharge are basically unknown, the effect of these withdrawls cannot be determined quantitatively, but are assumed to be insignificant in light of the immensity of the area and the relatively small amount of water utilized. The increased ground cover expected from the two existing AMPs and limited overall range improvement would favor groundwater recharge.

Vegetation

If livestock grazing management were to continue under this alternative, vegetation trends overall would be expected to swing upward, level off, then slightly decrease, and then level off again above the existing forage level but still below the level expected under the proposal. This level of vegetative productivity would still be below acceptable levels of sustained yield obtainable through the proposed action. The only two expections to this would be the Wagon Johnnie and Willow Creek allotments which would be continued under the established grazing systems.

Grazing of vegetation anytime during the growing period until food storage is completed is harmful. Any two-month period of "no

PRELIMINARY DRAFT

water usage. The net effect on water quality cannot be estimated from present data.

Average annual groundwater withdrawal would approach 1,700 acre-feet by the year 1977, an increase of 1,600 acre-feet, or 30 percent over existing withdrawals. Since the quantity of available groundwater and the rate of recharge are basically unknown, the effect of these withdrawals cannot be determined quantitatively, but are assumed to be insignificant in light of the immensity of the area and the relatively small amount of water utilized. The increased ground cover expected from the two existing dams and limited overall range improvement would favor groundwater recharge.

Vegetation

If livestock grazing management were to continue under this alternative, vegetative trends overall would be expected to swing upward. Level off, then slightly decrease, and then level off again above the existing forage level but still below the level expected under the proposal. This level of vegetative productivity would still be below acceptable levels of sustained yield obtainable through the proposed action. The only two exceptions to this would be the Mancos Shale and Alluvial Creek allotments which would be continued under the rehabilitated grazing systems.

Erosion of vegetation across the riparian period until land stresses is controlled is harmful. Any two-month period of no

grazing" would not allow most of the key forage species to restore 90 percent of their food reserves. Generally, close defoliation of a plant year-after-year will ultimately result in depletion of food reserves and death of the plant (Hormay, Principles, Rest-Rotation, 1970). While vigor is decreasing it also has a decreasing effect on total volume, viable seed production, and seedlings, as well as litter. When any animal begins to graze they select primarily the choicest portions of the more palatable species. At later intervals as the most choice forage is consumed, more of the intermediate and lesser palatable species are consumed. Almost always the more highly palatable species are the more important species for watershed protection, wildlife, and wild horses.

Also, under this type of management, forage availability is more dependent upon precipitation. For example, if livestock graze during periods when precipitation is below average, little growth or regrowth would be available in the following year when livestock are again turned out. Under a rest period at least some dry growth would be available for the sustenance of animals.

In the short-term, some 142,659 AUMs of livestock forage; 6,240 AUMs of wildlife forage; 12,257 AUMs of deer forage; 2,070 AUMs of antelope forage; and 546 AUMs of bighorn sheep forage would be available in the study area. However, in the long-term the forage resource would decline, falling short of projected reasonable demand numbers. This would result in a deficiency of some 21,319 AUMs the first few years and a decrease thereafter as the

PRELIMINARY DRAFT

more palatable species are replaced by the less palatable, less desirable forage.

Threatened and Endangered Plants: With respect to threatened and endangered plants which are palatable to cattle and wildlife, it is assumed that in areas of poor range condition, they could be eliminated. The converse would be true for undesirable species. Where range conditions are static, it is assumed that such plants would maintain themselves. It is further assumed that the types of impacts under the "no action" alternative would be similar to affects noted under the proposed action (see Chapter II).

Wildlife

Terrestrial Habitat: Under the "no action" alternative, wildlife populations could be expected to increase in response to wildlife forage allocations, reduced livestock numbers, and the limited habitat improvement realized from exclusion of livestock from NRL for the minimum two-month period. The increase in wildlife abundance and improved habitat quality would not persist over the long-term as a result of the selective livestock

PRELIMINARY DRAFT

use which would result in continued over-utilization of meadows, stream margins, and areas of similiar vegetation. The limited existing waters and limited improvements inherent under the "no action" alternative would result in poor livestock distribution with consequent deterioration of habitat in concentrated use areas. The selective grazing of livestock on areas not under AMPs would encourage the invasion of brushy plant species with resultant increase in wildlife species adapted to this habitat type. Species in this category include pinyon mice, deer mice, pocket gophers, and rabbits. More arid locations would be dominated by kangaroo rats, antelope, ground squirrels, etc. Wider ranging species, such as deer, antelope, and many birds, would also be influenced by habitat changes on these areas because of their dependence on these habitats during seasons when other habitat becomes undesirable or unsuitable.

Big game populations would be expected to increase in all but a few locations because of an MFP allocation of forage previously licensed for livestock, and the limited forage improvement to be realized from a two-month exclusion of livestock from NRL. Mule deer numbers would be expanded by an estimated 1,300 head as a result of the initial improvement in forage conditions. Pronghorn antelope populations would be anticipated to improve similiarly for an estimated increase of approximately 200 animals. Bighorn sheep numbers would increase by an estimated 80 head in response to the reduced livestock competitions and habitat improvement. While mountain lion status over the area is generally unknown, it is assumed that an increase in the primary prey

PRELIMINARY DRAFT

(mule deer) would provide for increased production and subsequent population increases of mountain lions.

Game bird populations of sage grouse, quail, chukar, and mourning dove would not be expected to show the increase estimated for big game as a result of continued and heavy utilization of meadow areas, stream margins, and similiar areas of critical importance to these species. Populations of these species would remain relatively static, with possible declines in sage grouse through continued heavy use of meadows and stream margins critical to sage grouse as brooding and rearing areas.

Range conditions would improve on the two allotments covered by existing AMPs. These improvements would increase habitat for wildlife species of these areas. In addition, the rested portions of the allotments would be available to wildlife, further increasing food and cover for such species as deer, rabbits, and many song birds, as well as providing additional nesting sites and perches for raptors, and den areas for predatory mammals.

Range improvements, such as wells, stock tanks, pipelines, and other water developments, which provide critical wildlife needs, would increase wildlife numbers and distribution. These improvements would continue to be made on allotments under AMPs. However, construction and maintenance on such projects not under AMPs would only be authorized through approved Section Four permits or cooperative agreements.

PRELIMINARY DRAFT

Aquatic Habitat: The aquatic habitat would remain in poor to fair condition in most allotments under continuation of the present management direction. The reduction in livestock numbers by 20 percent and the two months rest would benefit some streams, such as Mosquito Creek and Pine Creek. Changes in habitat condition trend would be more in the rate of change than in the direction. The heavy use the remainder of the year would prevent any overall improvement in habitat condition.

Six Mile Creek would improve in the Hot Creek allotment because of the MFP decision to eliminate livestock use from the Morey Peak back country area. Sediment into the stream would be reduced and bacterial pollution from livestock would be eliminated in the Six Mile drainage.

Elsewhere in the Tonopah study area sedimentation of streambeds would continue at approximately the same rate as if present where overgrazing by livestock is occurring. Where overgrazing by livestock is occurring and where watershed conditions are declining, increased sedimentation would result from overland flow, channel erosion, and stream bank trampling.

Fish populations would decline because of reduced cover, poorer survival of eggs and fry, and a reduction in food organisms. Water temperatures would be increased to the level some streams would no longer support the trout populations that now exist.

PRELIMINARY DRAFT

Wild Horses

Implementation of the Nevada Range policy and Tonopah MFP would result in adequate forage, water, and space for wild horses.

With the present livestock management situation, wild horses have the advantage of using much of the rougher, steeper country that livestock are not utilizing because of steepness of slope or lack of water. For the "no action" alternative livestock grazing would remain much the same and the competitive advantage enjoyed by wild horses would continue.

New fencing projects would be limited in number, which would be conducive in maintaining the present free-roaming habits and behavior of wild horses.

If present management were to continue, it is assumed that wild horse numbers would not fall below 520 animals (Tonopah MFP Decision).

Visual Resources

Reductions in stocking rates and the removal of livestock from federal range for at least two months during the critical plant growth period is expected to allow gradual improvement in plant vigor, and over the long-term, a higher quality vegetation component for scenic values. Some improvement in density, color, and texture would help create harmonious vegetative patterns, and would contribute to an overall "healthy" range appearance. It is not likely that

PRELIMINARY DRAFT

any Visual Resource Management (VRM) Classes in the Tonopah study area would be raised or lowered as a result of grazing management under the "no action" alternative.

Trails and fenceline contrasts would not develop along fences, as they would under the proposal, since no allotment or pasture boundary fences would be built. Highway fences, cattleguards, or water developments would not be built, which would help maintain a relatively undeveloped character in the area. No range improvement projects would be constructed either in the two existing AMPs or on other allotments without input at the planning stages by a landscape architect, or without review to insure that VRM Class objectives are met. Construction crews and equipment would be present for short time periods. Short-term surface disturbances would occur with any improvements under this alternative.

Cultural Resources

Under the "no action" alternative, the continuation of present management under the Nevada Range Policy would result in continued adverse impacts to cultural resources. A total of 304 cultural sites (not including 13 sites within the proposed Morey Peak primitive area and Six Mile Canyon back country use area), which are closed to grazing under MFP decision including four National Register and five National Register eligible properties, would continue to deteriorate as a result of the effects of livestock grazing as indicated in Chapter III. The rate of deterioration of the resource would be expected to stabilize with the present condition and

PRELIMINARY DRAFT

decrease from the potential rate of deterioration from implementation of the AMPs because of less density of cattle per pasture and removal of cattle from range during two months of the spring season. The erosion condition would be expected to improve and eventually stabilize at a level above the present and below that predicted with implementation of the Allotment Management Plans (AMPs). Thus, cultural resources would continue to be impacted by erosion though at a rate below that of present condition. Impacts from project activities (including both management facilities and land treatments as discussed in Chapter II) would continue in the present trend, stabilizing far below the rate of deterioration of resources expected through implementation of the proposed action. Under this alternative, the impacts on cultural resources from road construction and use would also continue in the present trend, or a rate of deterioration of resources below that expected from the proposed action. The stabilization of the rate of deterioration from project activities and road construction would be expected to also stabilize the deterioration from vandalism related to these activities.

The net results of the implementation of this alternative would be the continued deterioration of the cultural resources data base and restrictions of the possibilities of regional cultural research. The rate of deterioration would stabilize at continuation of the present trend, which would be below the rate of deterioration expected through implementation of the proposed action (AMPs).

PRELIMINARY DRAFT

Land Uses

Private base properties would be used for livestock under the "no action" alternative during the minimum two-month removal period stipulated under the Nevada Range Policy. These private lands would not be available for other uses during that spring period.

Without the proposal, fences, water developments, or land treatments would not impact future land use actions, applications, or withdrawals. Livestock-urban area conflicts could occur without the proposed action, since AUMs in those proposed disposal areas would be deducted from livestock operations in urban expansion zones around the communities of Tonopah, Manhattan, Round Mountain, Ione, and Berlin.

Recreation Uses: Less interference and fewer conflicts between livestock operations and outdoor recreation activities would occur with the "no action" alternative. This is because livestock would not be concentrated seasonally in pastures, and new water developments, fences, and seedings would not be subject to the problems associated with heavy recreation uses.

PRELIMINARY DRAFT

Without the proposal, 33 water developments would not be constructed, reducing opportunities for hunting, sightseeing, and other water-related activities. Springs proposed for water development are presently supplying wildlife water, are attractive to artifact collectors, sightseers, and hunters. Development would not in itself increase use at these sites, nor would "no action" necessarily decrease or increase recreation visitor use. The "no action" alternative would allow deterioration of live springs and seeps to continue, while development and fencing as described in the proposal would presumably protect these wet areas and water sources from trampling and pollution by livestock.

Without the proposed land treatments, 37,760 acres would remain in a natural condition, and would not be closed to recreation vehicle use.

No significant impacts are expected for woodland products or utilities systems. Less road maintenance would be required under the "no action" alternative. This is because fewer road miles would be required, and less management activity would occur.

Livestock Grazing: From a livestock standpoint the "no action" alternative would be viable in the short run and produce an upward trend and higher livestock production from that of the existing environment. Over the long run, however, livestock production would level off at a

PRELIMINARY DRAFT

sustained yield below the proposed action. The livestock operators under a water base system (Reveille allotment) might find it difficult to provide adequate base property to feed their livestock. Also those operators running on a parallel base would need to fence their base properties or find other lands on which to hold their livestock during a two-month period. An operator might be able to change from a cow-calf operation to a strict steer operation, but this would appear to be difficult. It would require buying in the spring and selling in the fall or winter. Range improvements would be slowed down and reduced in number which would mean that high impact areas under the existing management would remain the high impact areas. Livestock grazing would be highly dependent on weather fluctuations from year-to-year. Problems with trespass between allotments or between Bureau of Land Management allotments and the U.S. Forest Service would continue. There would not be the overall 31 percent reduction in livestock grazed as under the proposed Allotment Management Plans. But, there would be a 20 percent overall reduction in accordance with the MFP forage allotcation. That would mean approximately 16,530 more AUMs of livestock forage consumed each year.

Social-Economics

Under the "no action" alternative, the management scheme is to improve the range through implementation of the Nevada Policy (Taylor Grazing Act of 1934). Essentially, this would require limiting actual license use for livestock grazing to be consistent with vegetative limitations, alternative uses (recreation, wildlife, wild

PRELIMINARY DRAFT

horses, etc.), and technological advancement in management practices.

Economically, implementation costs would include: planning, coordinating, implementing, and regulating forage allocation for livestock and wildlife; providing recreational areas; and protecting cultural resources.

Deleted from the original proposal, as in Chapter I, would be fencing, many water improvements, and vegetative (spraying and seeding) improvements. A considerable amount of the governmental funds proposed in Chapter I would be unnecessary. Allocation of grazing fees for projects as required by PL 45-579, the so-called Organic Act, would be the primary source of funds for improvements to be established on NRL.

Regulating AUM use during active grazing periods and restricting use during the two-month critical growing season on NRL would require three Bureau of Land Management (BLM) personnel.

Ranchers would be required to manage their herds in much the way as in the original proposal. From 35 to 45 man-months of hire labor would be required.

Income generated from the "no action" alternative would come from: 1. grazing, 2. manpower needs, and 3. recreation-related events.

PRELIMINARY DRAFT

Grazing through the "no action" alternative would be expected to increase ranching revenues in the study area by $150,000 upon the fifteenth year after the alternative is instituted (see Appendix L Table, Grazing AUM Use). This approximately $350,000 less than if the initial proposal were instituted. The manpower needs for both ranches and the BLM would be the same as in the original proposal. Between $20,000 to $30,000 for BLM supervision and from $16,000 to $23,000 for ranch-hired labor incomes would be generated (see Chapter III, Social-Economics). Recreation income, as discussed in Chapter III, Social-Economics, would be expected to increase by 70 percent over the 1976 figure of $90,445.40. The expected level is approximately $100,000 less than if the original proposal were instituted.

Tax revenues from the additional cattle on NRL would be approximately $10,500. That figure is about $27,000 less than in the original proposal (see Appendix L Table, Tax Revenue Calculation.)

PRELIMINARY DRAFT

MINIMAL INVESTMENT TO ACHIEVE BASIC MANAGEMENT OBJECTIVES

Description

Under this alternative, grazing would occur in much the same way as described under the proposed action. Livestock would be rotated through control of waters, salting, herding, and limited fencing.

The following conditions are assumed applicable:

1. Adjustments in use would be made, as in the proposed action, to balance forage production with forage use. Allocation of forage would be as determined through the Management Framework Plan (MFP).

2. The existing Allotment Management Plans (AMPs) for the Willow Creek and Wagon Johnnie allotments would be maintained, with proposed projects implemented in accordance with each plan.

3. Meadow areas, streams, and similar vegetative areas on national resource lands (NRL) would be fenced to exclude livestock use. Such areas would require water gaps to allow livestock use and to facilitate water control. The remaining areas, with the exception of limited gap fences, basically would be free of fencing.

PRELIMINARY DRAFT

PRELIMINARY DRAFT

Approximately 1,000 acres of streams and meadows would be excluded using approximately 300 miles of fence.

4. The livestock control required to rotate use and meet plant requirements could be accomplished through water control, herding, salt distribution, and limited fencing to control drift.

5. Range improvements, with the exception of fences, would be the same as described for the proposal.

6. Livestock would be removed from rangelands for a minimum of two months during the plants' critical growth period (4-15 to 6-15 in most allotments).

7. Existing fences would be maintained and incorporated into the grazing systems.

Analysis

Because the level of grazing under the minimal investment alternative would not be basically different than under the proposed action, impacts noted in Chapter III, with the exception of fences and meadows, streams, etc., would be the same. Actions proposed under this alternative would not be expected to affect climate, geologic setting, or topography. The major difference

Approximately 1,500 acres of streams and meadows would be excluded using approximately 300 miles of fence.

4. The livestock control required to locate ties and water plant requirements could be accomplished through water control, herding, salt distribution, and limited fencing to control drift.

5. Range improvements, with the exception of fences, would be the same as described for the proposal.

6. Livestock would be removed from rangelands for a minimum of two months during the plants' critical growth period (4-15 to 6-15 in most allotments).

7. Existing fences would be maintained and incorporated into the grazing systems.

Analysis

Because the level of grazing under the minimal investment alternative would not be basically different than under the proposed action, impacts noted in Chapter III, with the exception of fences and meadows, streams, etc., would be the same. Actions proposed under this alternative would not be expected to affect climate, geologic setting, or topography. The major difference

PRELIMINARY DRAFT

between this alternative and the proposed action consists of exclusion of streams, meadows, and mesic vegetation areas (estimated at 1,000 acres) from livestock use and 300 miles of fence proposed instead of the 949 miles required under the proposed action. Because of the similarity between actions, many of the impacts for the alternative would be as, noted in Chapter III.

Air Quality

Construction of about 300 miles of fence around meadow areas, springs, and along streams would temporarily disturb about 540 acres. Since clearing and cover disturbance would be confined to the minimum area possible, and ground cover would be reseeded, fugitive dust, and exhaust emissions from fencing would be insignificant.

Air quality impacts from all livestock herding, water developments, and land treatments would be the same as those shown in Chapter III for the proposal.

Temporary, localized fugitive dust and vehicle exhaust emissions would result from the required livestock control operations, i.e., salt distribution, water management, and existing facilities maintenance.

Soils

PRELIMINARY DRAFT

Under the minimal investment, forage production on presently grazed areas would be expected to increase with concurrent improvement of vegetative cover as a result of the cyclic rest and reduced numbers. The expected improvement would be equivalent to that realized under the proposed action with additional benefit realized from the exclusion of livestock use from such critical erosion areas as willow and Barley Creeks. Erosion condition classes could be potentially decreased through the elimination of livestock use from meadows, stream margins, and areas of similar vegetation. The projected vegetative improvements would reduce potential losses from wind erosion to slightly lower levels than the present situation. The localized situations of erosion, both wind and water related, precludes overall quantitative assessment.

Potential sediment yields would be expected to undergo a reduction, slightly greater than under the proposed action. The protection afforded to stream banks with resultant decreased sediment production would provide reductions in sediment yield. The reductions would be generally localized with an immeasurable effect overall. Specific improvements are noted under aquatic habitat.

Water Resources

PRELIMINARY DRAFT

Runoff rates would be the same as noted in Chapter III, Impacts of the Proposed Action.

Water quality would be expected to show marked improvement in relation to turbidity. Fecal coliform content in surface waters is largely related to livestock use of stream areas. The exclusion of livestock from the majority of free water situations would limit use to water gap areas, for a general improvement in waters previously subjected to livestock usage. The chemical quality of surface waters would probably reflect the localized improvement of stream margins, and other areas of surface water. The net effect on water quality cannot be estimated from present data.

Impacts on groundwater withdrawal would be insignificant.

Vegetation

This minimal investment proposal would still have 300 miles of fences, 33 wells, 32 springs, 103 troughs, 157 miles of pipeline, 3 tanks, and 32 cattleguards which would disturb 770.4 acres during construction. They would permanently occupy and disturb 404.6 acres.

PRELIMINARY DRAFT

Vegetatively, the impacts would primarily be the same for this alternative as for "no action," except that all the meadow areas, springs, and perennial streams would be fenced to exclude grazing animals.

Initially the removal of livestock grazing from 4-15 to 6-15 would show an upward trend. It would then level off, and still have forage production on a sustained yield below the proposed action.

The alternative of rotating livestock with water is not feasible because trying to shut water off from a spring or seep or a perennial stream would be almost impossible. Even if water could be shut off wildlife and wild horses would have to follow the livestock, therefore increasing competition for forage. The amount of herding required to keep the livestock off areas that are supposed to be rested would be greatly increased. The critical growth period removal of grazing would, however, be of tremendous help in the Darrough Hot Springs and Hunt's Canyon allotments.

Trespass would be difficult to control between allotments. Cattle would be more concentrated along roads and highways because of the proximity of waters to the highways, causing traffic hazards to increase significantly. The effects of proposed total rest

PRELIMINARY DRAFT

periods would be decreased in that livestock could not be kept completely out. Increased riding (herding) would still not result in locating all livestock in the wrong pasture. It is unlikely a rancher would ride by horseback over an area of 100,000 acres for even 50 head of cattle or that a rancher would even be aware stock were in the unused pasture.

Wild horses would have access to forage in areas they have not previously used. However, the amount of change a herd would make is impossible to foresee.

Assuming that herding, water management, and salting could be done, most impacts on vegetation would be the same. An exception would be the disturbance from the reduction in fencing and the reduced impacts on vegetation in the Darrough Hot Springs and Hunt's Canyon allotments.

The amount of riding (herding) required to keep the livestock in the correct pasture would cause more stress on cattle and reduce weight gains.

Threatened and Endangered Plants: The impact on threatened and endangered plants would be basically the same as on other plants, i.e., consumptive use, trampling, soil compaction, and cyclic rest from livestock use would collectively cause impacts.

PRELIMINARY DRAFT

These impacts are assumed to be similar to those identified under the proposed action (Chapter III) with the exception that fence projects would be limited. Also, approximately 1,000 acres of meadows, etc., would be effectively removed from grazing use, thus reducing the possibility of directly affecting threatened or endangered plants through construction of fence or grazing of meadow or stream areas.

Wildlife

Terrestrial Habitat: Under this alternative general wildlife abundance would be increased above that projected under the proposed action. This would occur as a result of the reduced livestock numbers, sequential exclusion of livestock from rested pastures, forage allocation for expanded wildlife populations, and exclusion of livestock from the critical use areas of meadows, stream margins, and areas of similar vegetation.

Conditions would be basically as noted under the proposed action with two major exceptions: only one-third of the proposed fencing would be required, and meadow areas, stream margins, and areas of similar vegetation would be managed separately from the surrounding dry range areas.

The fencing of meadows, etc., critical use areas for nearly all

PRELIMINARY DRAFT

wildlife, during the period of a year would be expected to show a dramatic improvement in condition and overall production. The past deterioration and overutilization inherent even under the proposed action and "no action" alternative would be eliminated through fencing of these areas.

Maximum wildlife benefits could then be realized from these areas for projected increases of nearly all wildlife species dependent on these areas.

Mule deer populations would realize immediate benefit from provision of early green-up forage each year, and the quality browse of protected riparian woodlands. Competition between livestock and mule deer on these areas would be virtually eliminated with subsequent benefits. The exclusion of livestock from the identified areas, in addition to attainment of vegetative improvement on the remaining areas through grazing management, would result in mule deer in a quality habitat capable of supporting greater numbers than under the proposed action or other alternatives. Attainable mule deer numbers under this alternative are approximately 5,500 animals. This would represent an approximate 10 percent increase over the proposed action.

Pronghorn antelope would not benefit to the extent of mule deer, and possibly could be impacted adversely through the control of

PRELIMINARY DRAFT

water required to rotate livestock use. While range improvement similar to the proposed action is anticipated under this alternative, the required water control could affect availability for antelope with subsequent impacts. Antelope numbers under this alternative would be slightly less than noted with the proposed action; and approximately the same as expected under the "no action" alternative.

Bighorn sheep would be relatively unaffected by the exclusion of livestock from meadow and stream areas since these sites are commonly below the normal range of bighorns. However, the exclusion of livestock from such areas occurring within bighorn sheep use areas would provide a previously unavailable abundance of grasses and sedges. Bighorn population increases in response to habitat improvement under this alternative would be equal to those expected under the proposed action.

Fences - The use of approximately 300 miles of fencing to exclude meadows, streams, etc., would represent a major reduction as compared to the proposed action which would require an estimated 949 miles of fence. The relatively small amount of fence required to attain the same objectives, would greatly reduce the inherent impact of fences on wildlife movements.

Impacts from fences would be as indicated under Chapter III, only

PRELIMINARY DRAFT

reduced by approximately two-thirds as a result of the limited amount of fencing required under this alternative. Impacts from other projects would be same as the proposed action.

Small Game and Non-game Mammals: The improvement of meadows, stream margins, and general riparian habitat to be realized from the exclusion of livestock would increase the abundance and diversity of small mammals which utilize these sites.

Fences - Small mammal habitat would be impacted through the temporary loss of vegetation on approximately 720 acres disturbed during fence construction, and 404 acres occupied or disturbed over the long-term. Impacts from other projects, i.e., water developments, etc., would be same as the proposed action.

Bird: The notable beneficiary of improved meadows and similar areas would be the multitude of birds which require these areas for nesting and rearing of young. Sage grouse, which have evolved a critical dependence on these areas and suffered population declines as a result of their past and continuing deterioration, would show parallel increases with improvement. The requirement for quality riparian and meadow areas in the process of the normal life cycle for nesting, brooding, and rearing of young could result in major population increases where the protection of such areas provides quality habitat.

PRELIMINARY DRAFT

Sage grouse are but one of many bird species which find required habitat components in the diversity, and uniqueness of the small areas of riparian and mesic vegetation. These areas reflect near oasis conditions in comparison with surrounding dry land range areas.

The improvement anticipated from removal of livestock use, the primary cause of deterioration, would result in an overall increase in species abundance, and diversity. Bird species ranging from raptors, of which many require the aspen areas for nesting, to kill deer could be expected to increase in abundance in response to more favorable habitat conditions.

Aquatic Habitat: Aquatic habitat condition would gradually improve on national resource land (NRL). All streams except south Six Mile Creek originate on land of other ownership. Activities on those lands would continue to affect water quality and fish populations.

The overall impact of the minimal investment alternative on fish habitat would be highly beneficial. Fish populations in streams flowing onto NRL would be increased substantially because of decreased sedimentation of stream beds, decreased trampling, increased stream bank vegetative cover for fish, increased stream bank and channel stability, and lower peak water temperatures

PRELIMINARY DRAFT

because of increased shade along water courses.

Shorelines adjacent to reservoirs would be stabilized. Turbidity from disturbance by livestock would be reduced. The overall water quality would be improved because of reduced organic wastes and bacterial contamination.

Wild Horses

The impacts of the minimal investment alternative on wild horses in the Wagon Johnnie and Willow Creek allotments would be the same as for the proposal.

Limited fencing which may be done through herd management areas would have impacts similar to those created by fences of the proposal. Specific impacts could be more or less depending upon the location. For example, a fence which could trap horses at high elevations during winter could result in severe physiological stress from cold, and/or malnutrition due to the lack of available high quality forage. Such fences could also effectively block established seasonal movements, the specific impacts of which are unknown.

The control of waters with water lots around springs and troughs, fences along streams, and by pumping wells only when needed for

PRELIMINARY DRAFT

domestic livestock would have significant adverse impacts on wild horses. The impacts could be death from thirst when crucial waters were unavailable. Greatly increased physiological stress would result from relative crowding of horses into "pastures" of available water. There would be increased competition between bands and with cattle and big game wildlife species for space, water, and forage. Increased competition between stallions for mares and space for their bands would result. This competition would be intensified to the point, perhaps, of some animals dying of thirst if the increased demand for water by horses moving in from other areas were greater than the production of existing and proposed water developments. The result of this increased competition and stress is unknown, though it could lead to decreased fertility and general well-being of the animals. This may also result in movement of bands into adjacent areas, such as the National Forest, or into the next valley or mountain range, where competition is less.

If horses would not move to available waters because of strong home range instincts, because the pull of established seasonal movement is different from the current grazing cycle, or for other reasons, water lot fences and fences along streams in their use areas would be broken down when thirst rose to a certain intensity. This would render the fence ineffective and result in varying degrees of injury to horses who were wire cut or became

PRELIMINARY DRAFT

entangled in the wire.

There could be some reduction of the physical well-being of wild horses from a deficit in available forage. The overobligation would equal that demand by the additional horses which would come into the area for water (probably all the wild horses in the allotment). The poorer physical well-being, or condition, would result from reduced availability, quantity, and quality of forage in each "pasture". The intensity of this impact would vary with the size of the pasture, the number of horses, and whether any forage had been allocated to wild horses in the pasture. In the Reveille allotment, for example, pastures two and three are considerably smaller than pasture one. During grazing in the two smaller pastures, where no forage has been reserved for wild horses, there would be a significant overcommitment of forage.

Visual Resources

Fencing 1,000 acres of wet meadows, springs, and riparian vegetation would create isolated exclosures where vegetative form, color, and texture would take on a dense, healthy appearance in comparison to vegetation outside the fenced areas. These "islands" of darker coloration, greater vegetative variety, and relatively taller form would create positive contrasting elements along natural streams and drainages, and at natural seeps, springs, and meadow areas.

PRELIMINARY DRAFT

The approximately 300 miles of fence would cause line contrasts in the immediate area surrounding riparian vegetation. Fence-lines would surround isolated areas of varying sizes and would not extend linear contrasts over large areas. Stream bank fences would tend to merge with the riparian vegetation they are designed to enclose, and would cause minimal contrasts for the most part. Gap fences would contrast with valley bottoms, alluvial fan-foothill, and mountain-canyon landscape types in much the same manner as outlined in Chapter III in the Visual Resources section.

Removing livestock from the rangelands for a minimum of two months every spring would result in increased vegetative vigor and variety, which should improve the quality vegetation features over the long-term.

The effects of livestock concentrations and vegetation removal at water troughs, exclosures, gap fences, salt licks, and water gaps would be similar to the impacts described in Chapter III, Visual Resources..

Cultural Resources

Under the minimal investment alternative, continued adverse impacts to cultural resource would occur. Deterioration as a result of the effects of livestock grazing, as indicated in Chapter

PRELIMINARY DRAFT

III, would be expected to impact 304 cultural properties (not including 13 sites within the proposed Morey Peak primitive area and Six Mile Canyon "back country use area" which are closed to grazing through Management Framework Plan (MFP) decision, including four National Register and five National Register eligible properties. The rate of deterioration of the resource would be expected to decrease below the level of the present condition, the "no action" alternative, and the proposed action because of fencing of springs and meadow areas (high probability areas for cultural resources), reduction of erosion within these fenced areas, less density of cattle, and removal of cattle from the range during part of the spring season wet periods. The erosion condition would be expected to improve and eventually stabilize at a level above that of the present condition, "no action" alternative, and the proposed action. Thus, cultural resources would continue to be impacted by erosion, but at a rate below that of the present condition. Impacts from project activities (including management facilities and land treatment), as indicated in Chapter II, would continue under this alternative. The rate of deterioration would increase above the present condition, primarily because of the necessity of water development-related facilities, but would be expected to stabilize at a level below that of the proposed action, since approximately one-third of the fencing would be required under this alternative. Impacts on cultural resources from road construction and use would therefore also be expected to increase and stabilize at a level above the

PRELIMINARY DRAFT

present condition as a result of increased use and access necessary for construction and maintenance of facilities, but remain below the level predicted if the proposed action were implemented. With the initial increase and eventual stabilization of the rate of deterioration from the impacts of project activities and road construction and use, it is expected that vandalism, as related to these activities, would also increase and eventually stabilize at a level above present condition but below the level predicted with the proposed action.

Implementation of this alternative would result in overall stabilization of the rate of deterioration of the data base, with possible decrease in deterioration over the present trend below the rate predicted through implementation of the proposed action or "no action" alternative. The net result would be preservation of a larger percentage of the data base for future methodology and technology, and expansion of the possibilities of regional research.

Land Uses

Under the minimal investment alternative, all livestock operations would be required to use private base properties for a minimum of two months every spring. Feeding and confining livestock would essentially eliminate the pastures used during this period from other uses, such as livestock feed.

PRELIMINARY DRAFT

Gap fences would not be placed in areas where urban expansion, agricultural development, public purpose areas, communications, transportation, or utilities corridors are expected to occur.

Fences and water gaps at springs, reservoirs, wet meadows, and along streams would not significantly affect land uses since these areas would be excluded from development because of high wildlife, recreation, and aesthetic values.

Recreation Use: Removal of livestock from rangelands for two months during the spring would increase plant vigor, density, and variety, and would result in long-term improvements in the visual and aesthetic recreation environment. Herding, gap fencing, and salt distribution to manage grazing systems would not significantly affect outdoor recreation resources or activities, however, spring developments and water controls would cause some changes in visitor use concentrations and patterns. Wells would be shut off in rested pastures, which would tend to shift water-seeking recreationists to developed springs. Spring developments would have fenced exclosures and live water and, in most cases, would be attractive to a variety of wildlife species. It can be assumed that heavy hunting use areas would not decline in popularity just because wells are shut off to control livestock.

PRELIMINARY DRAFT

No significant impacts on outdoor recreation uses are expected to result from gap fences. Impacts from land treatments would be the same for this alternative as those discussed in Chapter III, Recreation Use.

Livestock Grazing: Under this proposal there would be 770.4 acres of vegetation disturbed during construction (short run) and 404.6 acres permanently occupied (long run). Although this acreage in itself is quite small, the areas to be fenced off are the higher productive areas and would be a significant amount of vegetation. Riding and herding activities would greatly increase from that of the proposed action and from the "no action" proposal.

Initially livestock AUMs would be the same as those under the proposed action (average of 98,646 AUMs per year) which is still an overall 21 percent reduction in livestock AUMs. Trespass between allotments and between pastures would be difficult to control. Wild horse competition for forage would increase in areas where they have not historically been because of tighter control of waters. Lower elevation areas in the late fall and early spring would have increased livestock numbers and it would be difficult to herd the livestock to keep them distributed.

Livestock control in accordance with the Allotment Management Plan (AMP) schedules is difficult to envision. An operator would

PRELIMINARY DRAFT

have to greatly increase his riding and herding. Even knowing if 50 head of animals were missing in some allotment pastures would be difficult to determine, let alone where the missing animals were located.

Losses of livestock from vehicular travel on highways would increase with density increases and lack of fences along highways.

Social Economics

This alternative (minimal investment) is similar to the proposal except for the amount of governmental funds available for project improvements. Essentially, the alternative calls for reduced fencing and fewer cattleguards. Water projects would still be developed at selected locations. Herd management and water usage areas would utilize specified pastures as in the rotation systems previously described in Chapter I of the original proposal.

An exception to the original proposal would be in AUM availability. A 10-month grazing cycle rather than a 12-month cycle on NRL would reduce allowable AUMs by one-sixth. Ranchers would have to develop an alternative grazing plan during this period either through other Federal (Forest Service) land or private lands. This could effectively increase the cost of each ranch operation. Also, additional hired labor (cowboys) would be needed to control herds on a regular basis.

PRELIMINARY DRAFT

Ranch employment should increase by five to ten employees from the proposed action. Bureau of Land Management (BLM) would add the same number (three) of personnel as in the proposed action. Construction employment would be approximately 300 man-months for the eight year implementation period.

Ranch income from grazing should increase through additional AUMs at a level between the "no action" alternative and the proposed action, between $150,000 and $500,000.

Manpower incomes would vary from $20,000 to $30,000 for BLM employees, from $45,000 to $75,000 for ranch employees, and approximately $240,000 for construction employees.

Recreation income, like ranch income, should increase at a level between the "no action" alternative and the proposed action: between $150,000 and $250,000.

Tax revenues would also increase proportional to the ranch income increase, which should range from $10,500 to $37,700.

Social Attitudes: Both alternatives have social complications. The "no action" alternative is essentially a minimal action alternative which would be more palatable to the ranching community and less palatable to other interest groups. On the other hand, the original proposal which is maximum action, is the

PRELIMINARY DRAFT

reverse of "no action" in acceptance by the self interest groups. The second alternative of minimal investment would be the least offensive to all groups concerned.

One point that is apparent, regardless of whether the proposal, one of the alternatives, or parts of each proposal were instituted, is that trade-offs must meet the objectives that are designed for the area.

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